FOUNDRY TRADE JOURNAL

EST. 1902

WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

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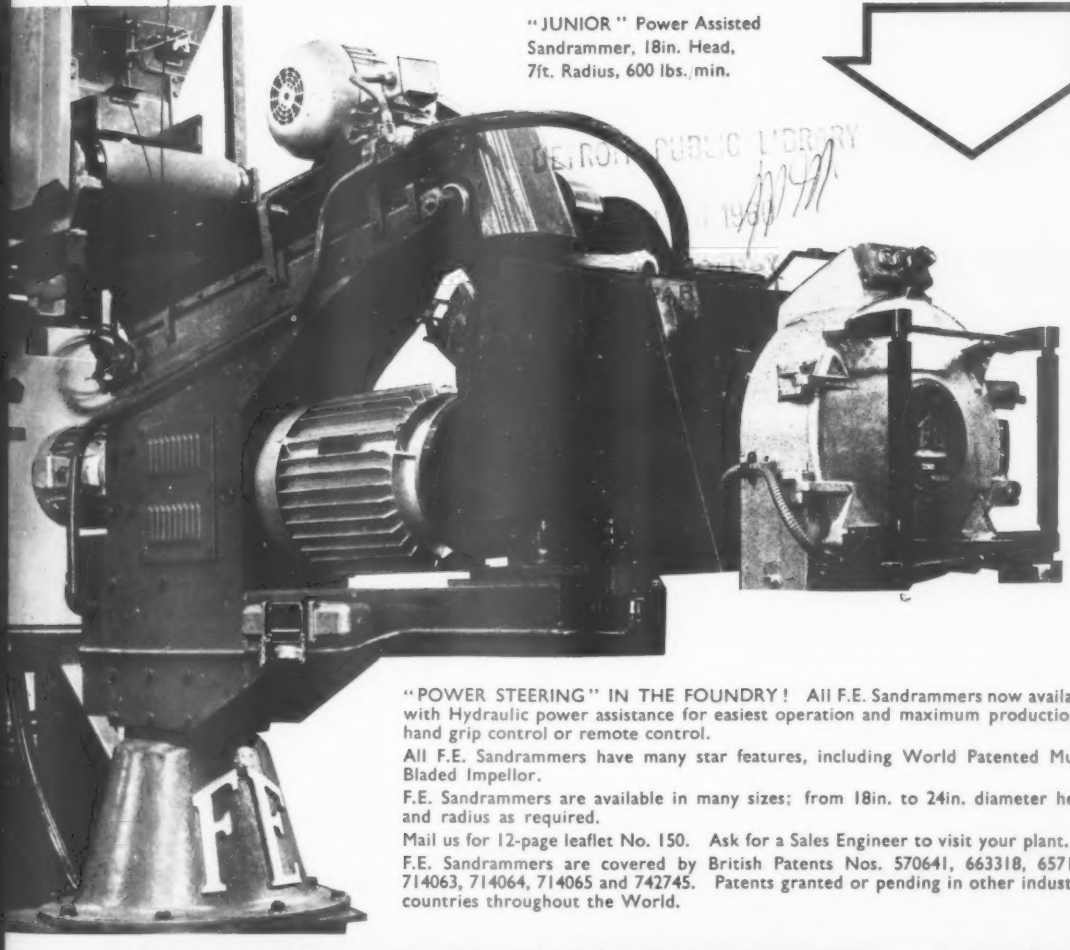

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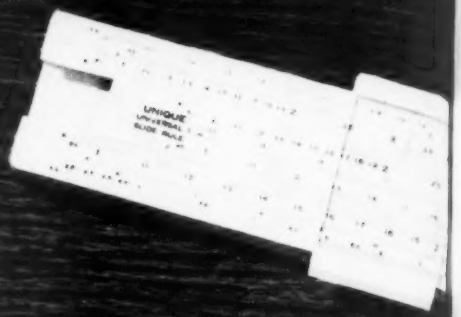

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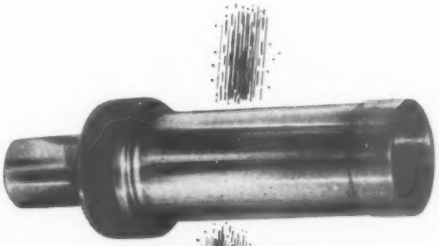

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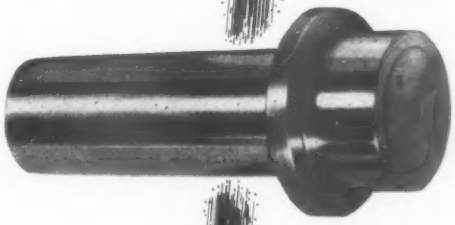

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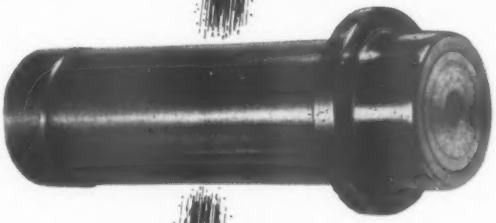

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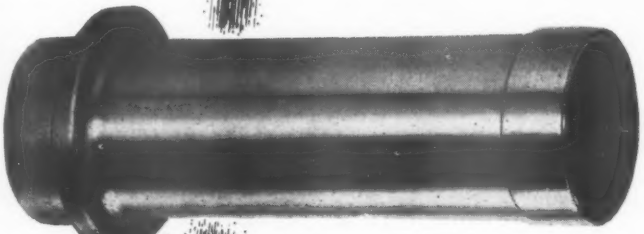

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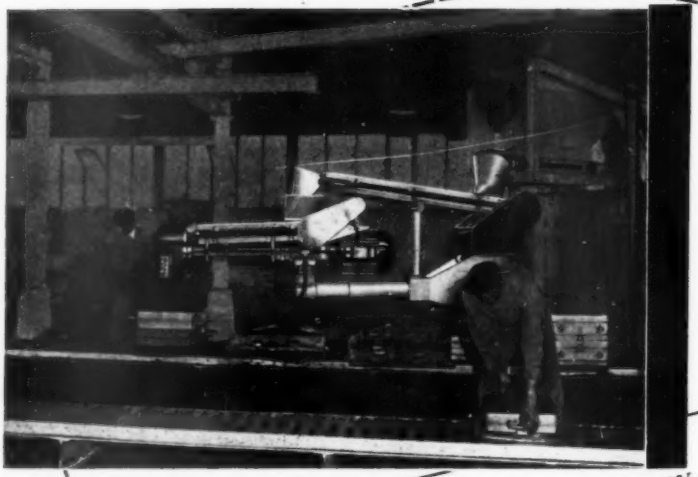

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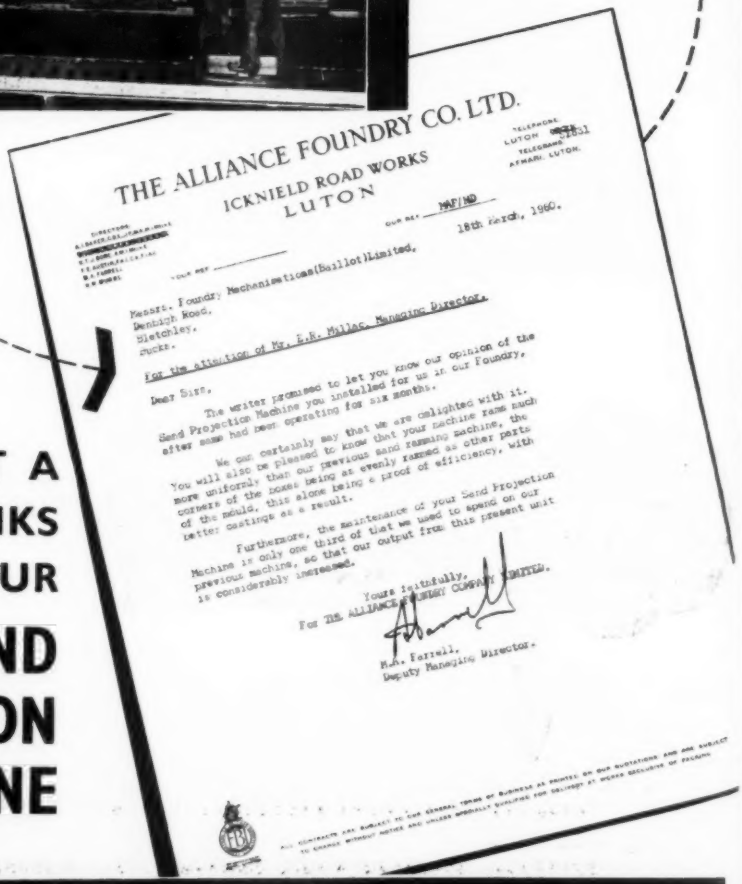

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For THE ALLIANCE FOUNDRY COMPANY LIMITED.
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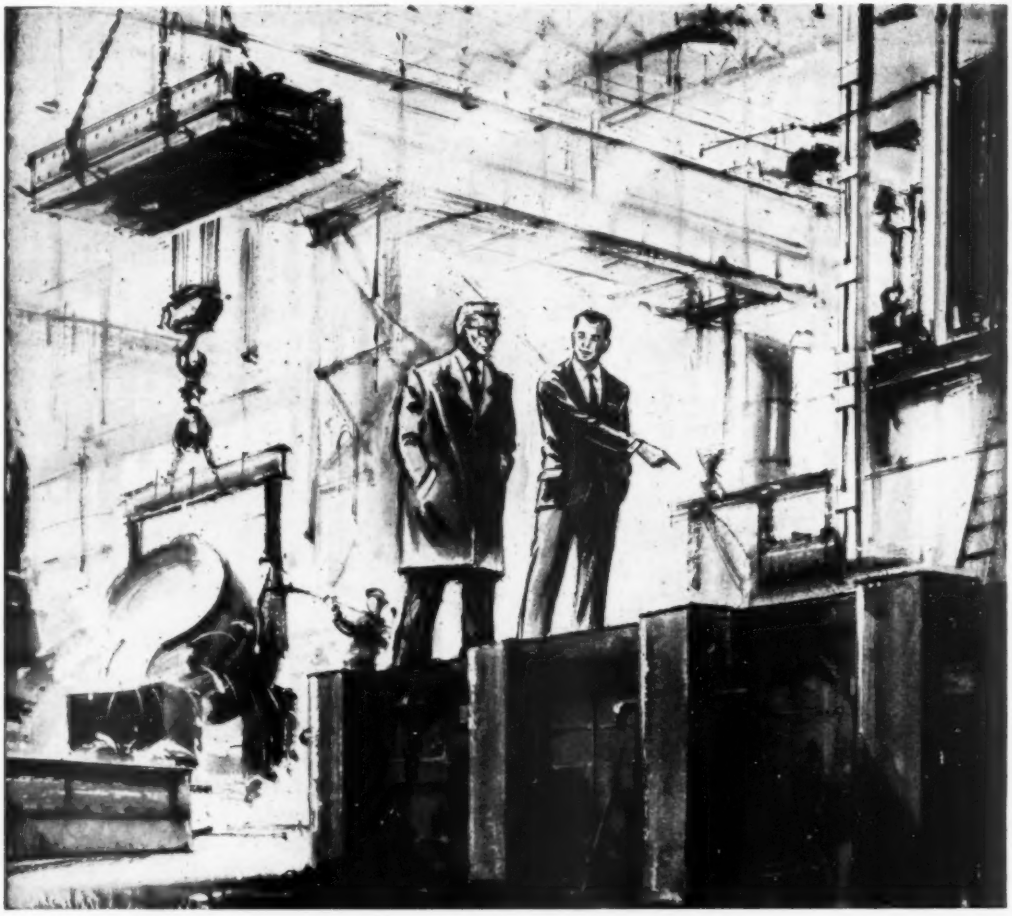

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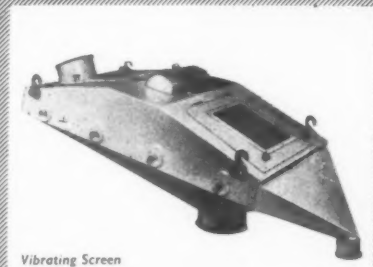

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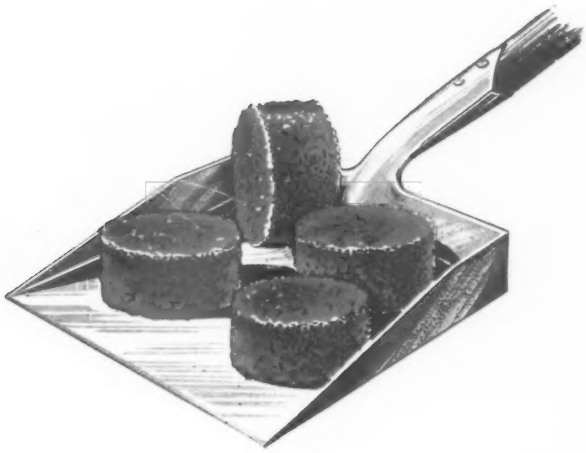

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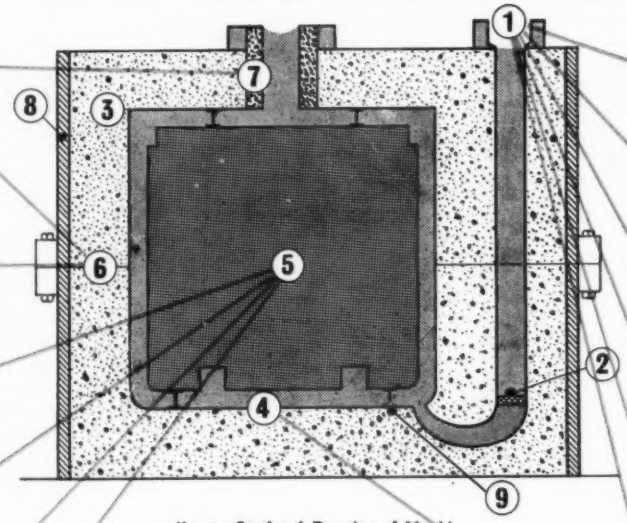

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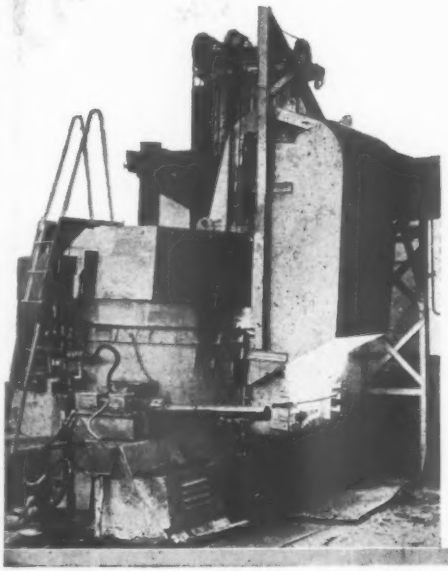

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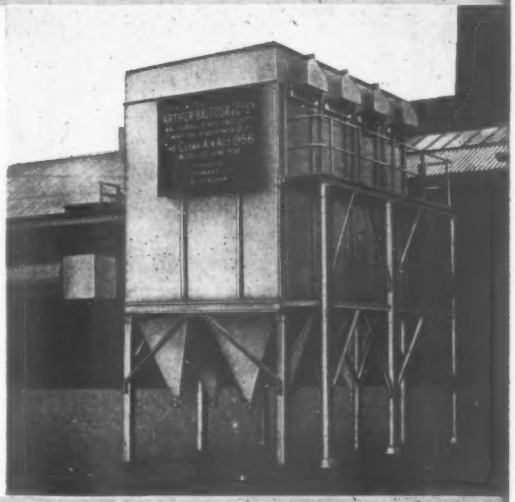

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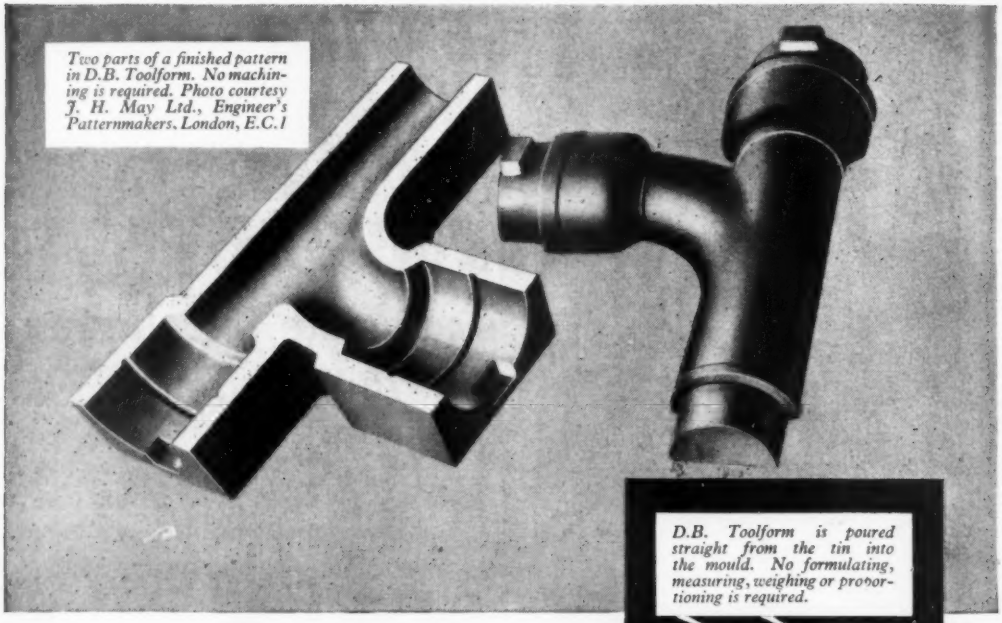

Two parts of a finished pattern in D.B. Toolform. No machining is required. Photo courtesy J. H. May Ltd., Engineer's Patternmakers, London, E.C.1

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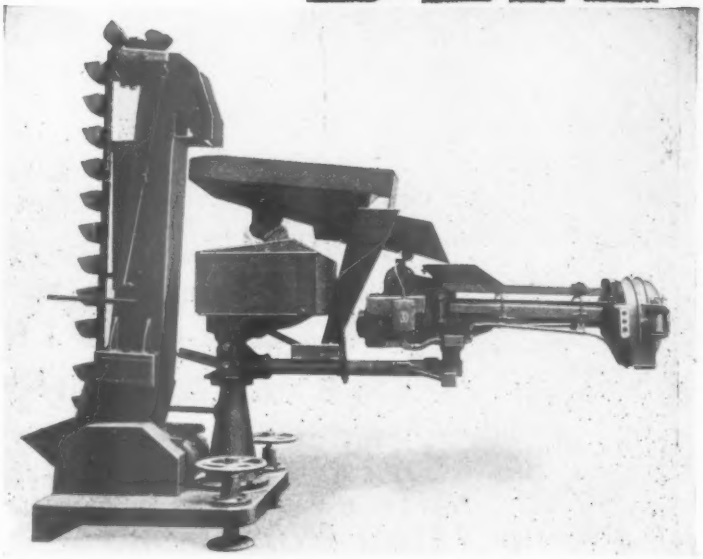

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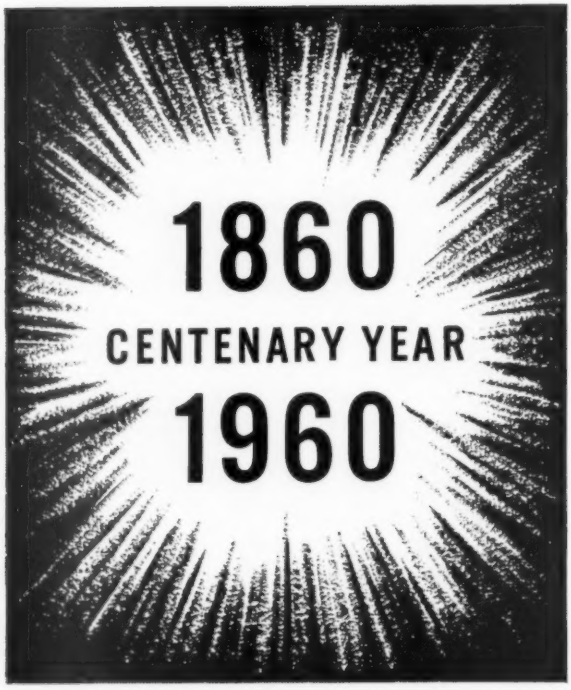

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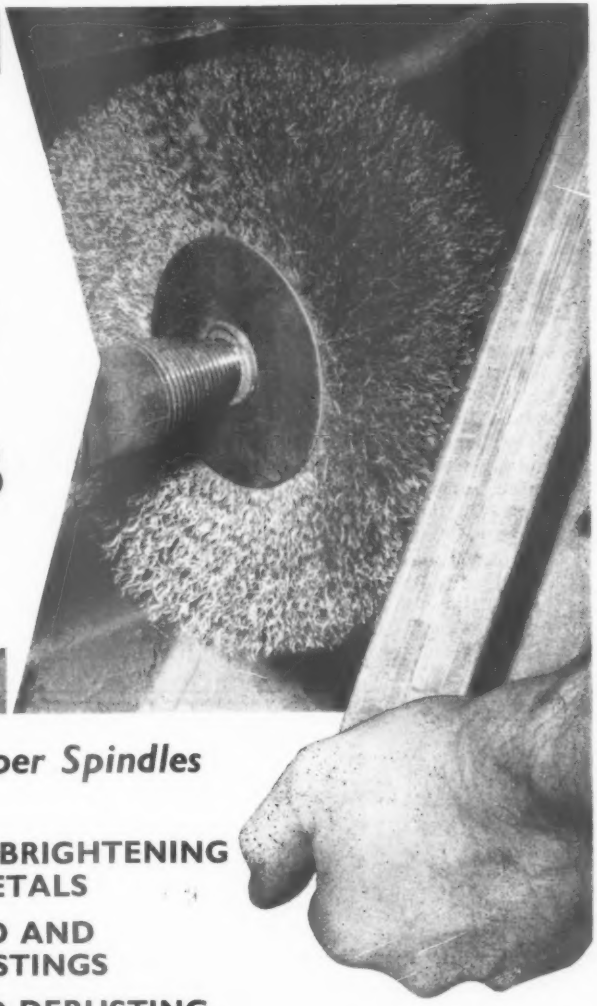

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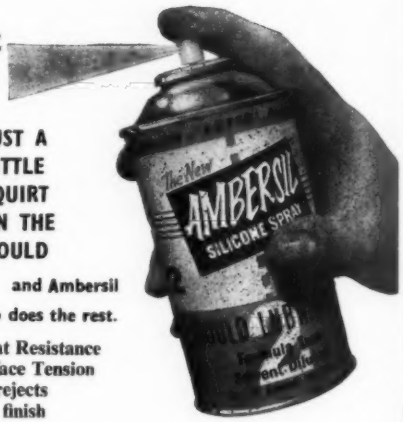

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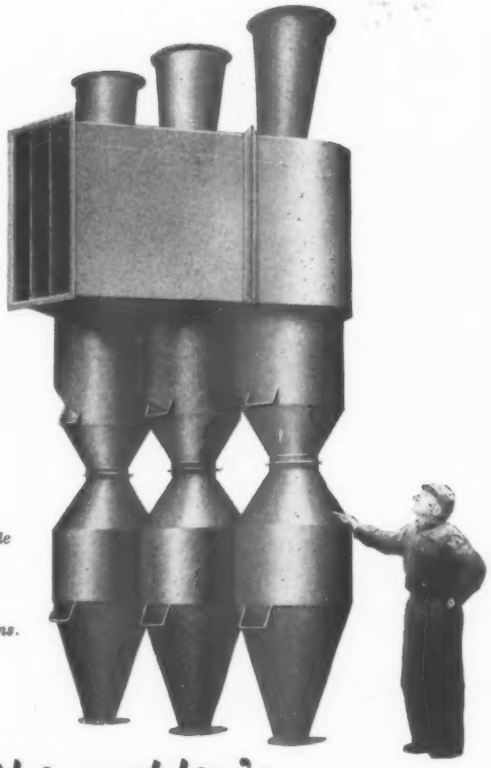

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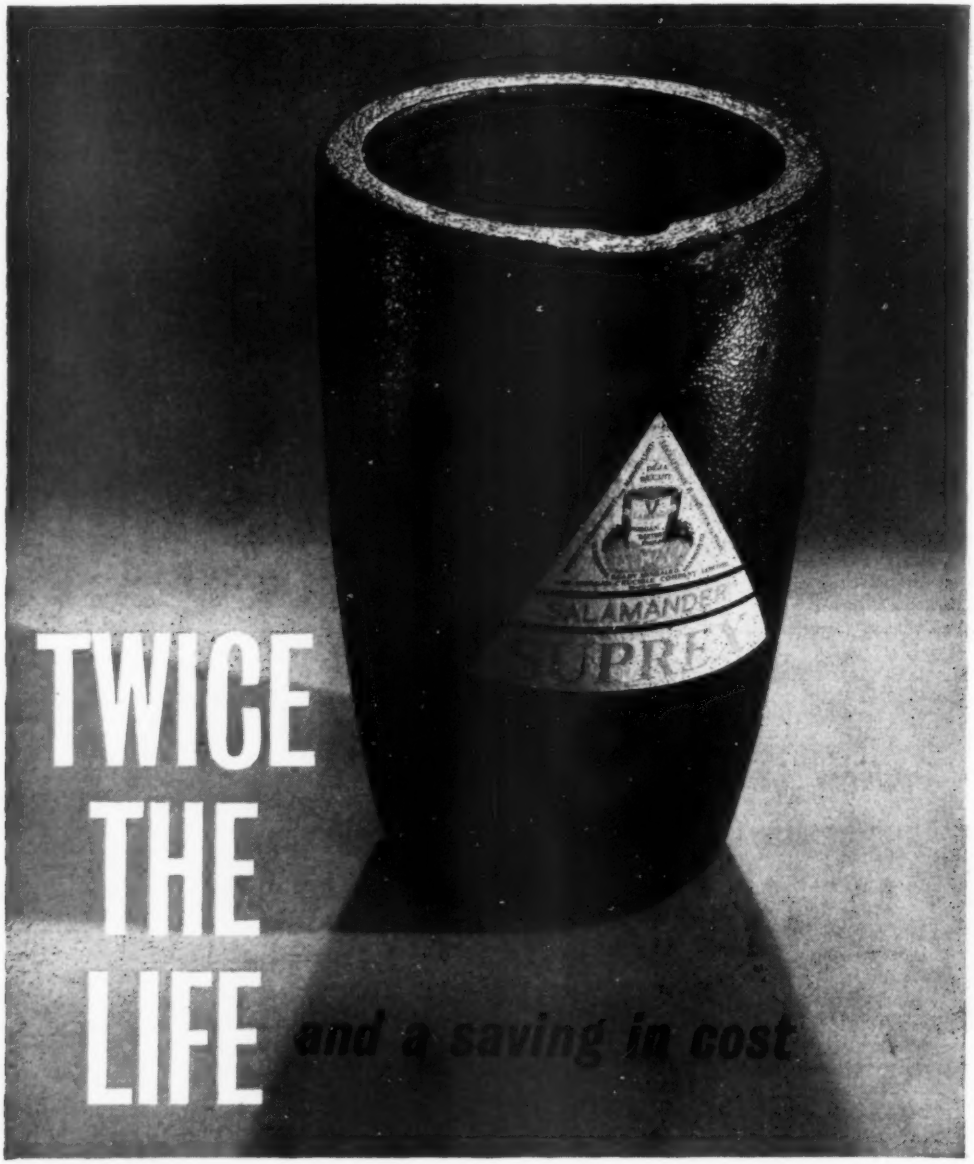

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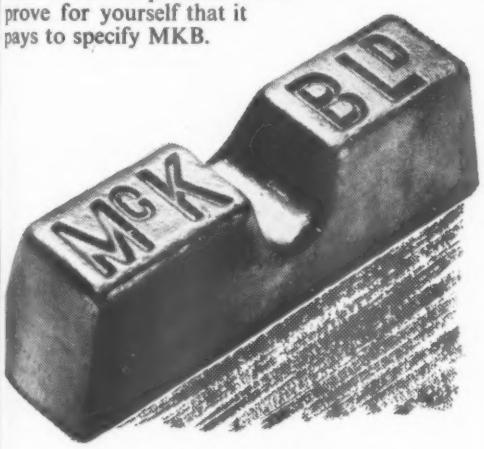

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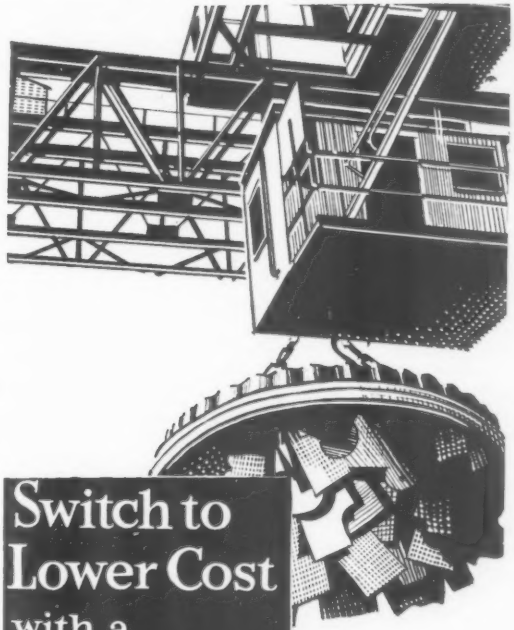

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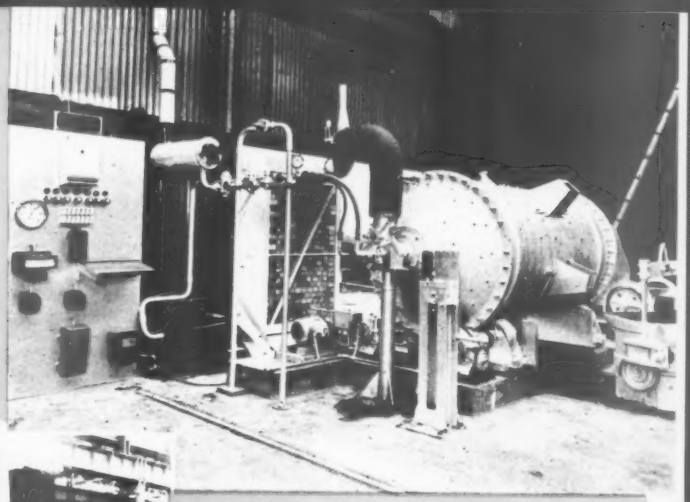

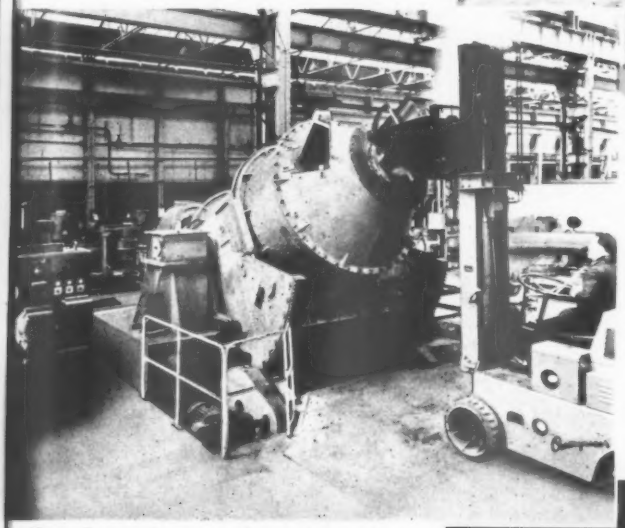

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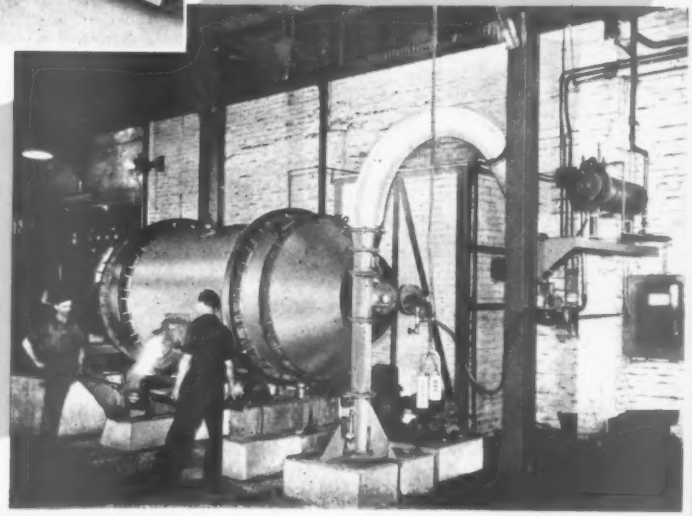

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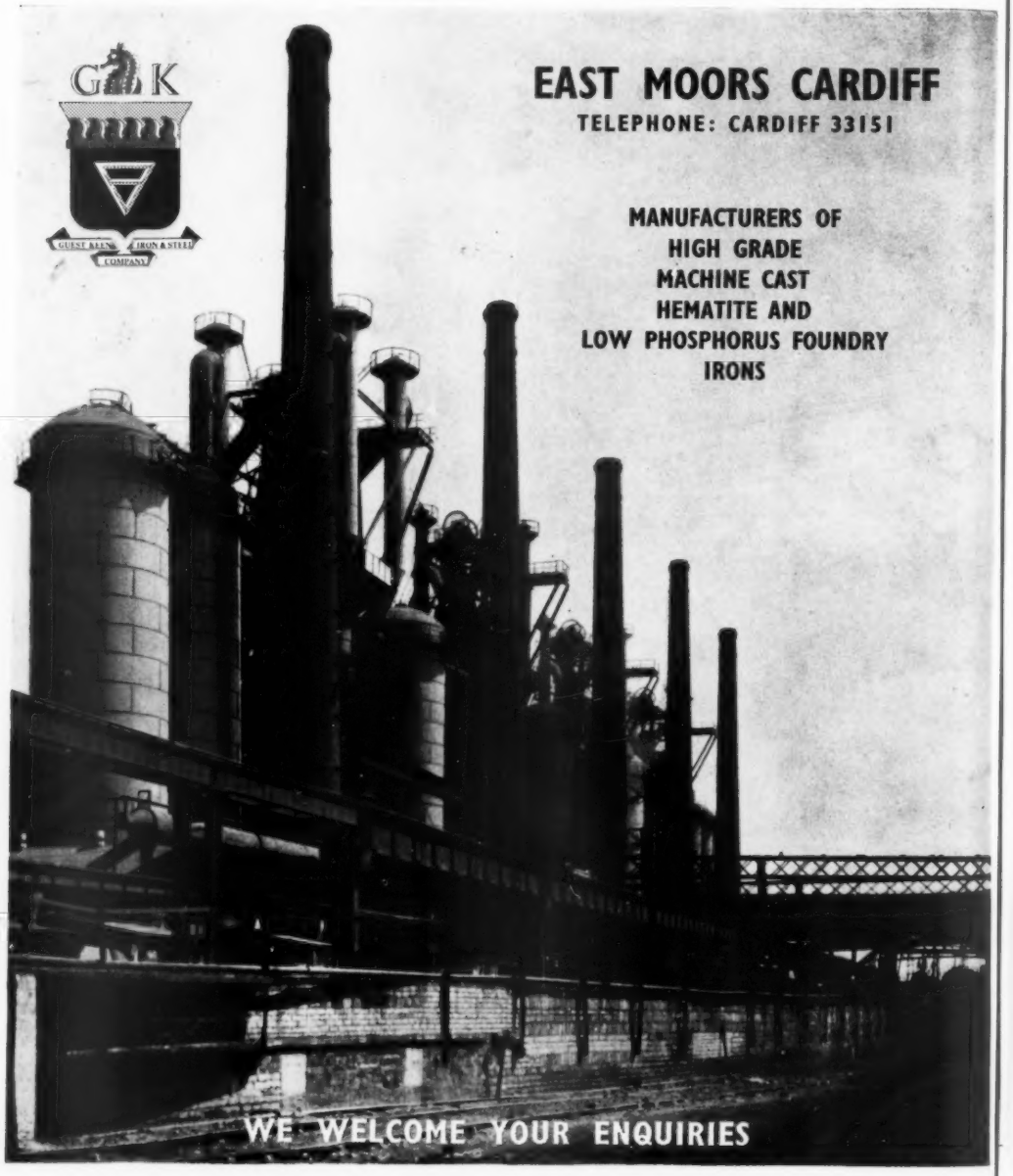

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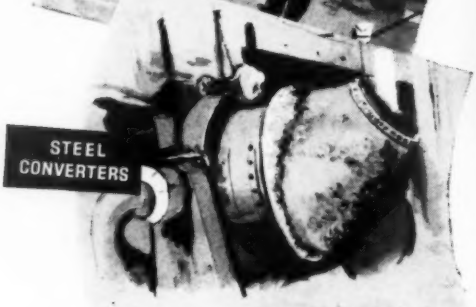

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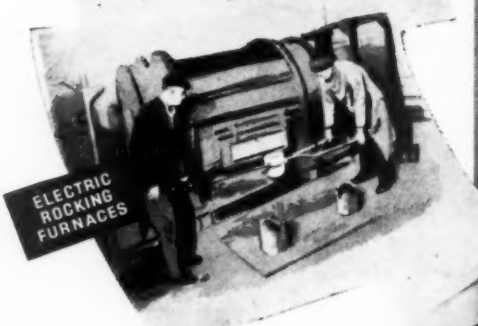

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FOUNDRY TRADE JOURNAL

Vol. 108 June 2, 1960 No. 2269

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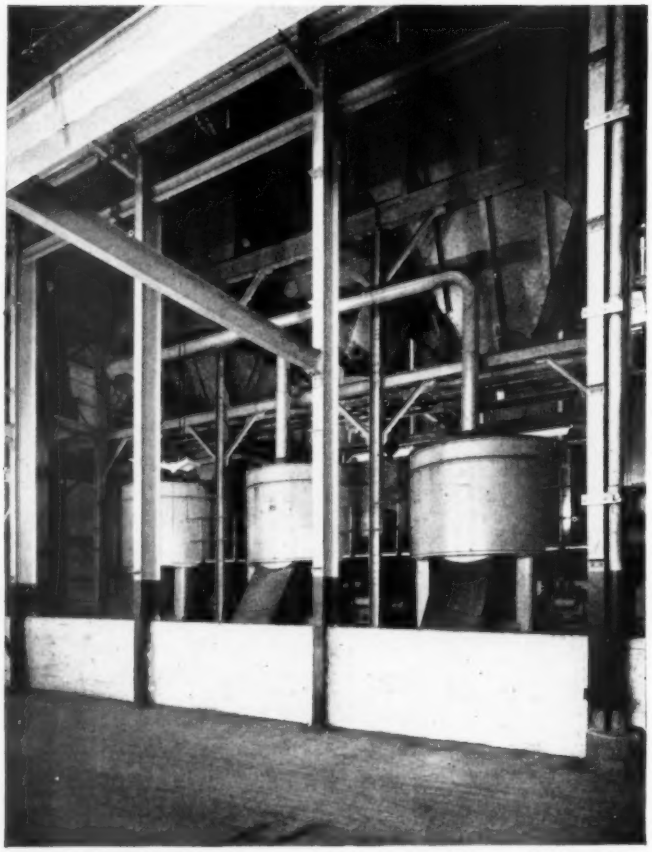

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FOUNDRY
TRADE JOURNAL

Vol. 108 June 2, 1960 No. 2269

Magnesium Foundry Industry

At last week's joint conference of the (American) Magnesium Association and the (British) Magnesium Industry Council, a graph was circulated showing that the Western world production of magnesium reached its peak in 1952 at about 110,000 tons and was lower each year until 1955, when about 75,000 tons were produced. Demand picked up in 1957, to 95,000 tons, since when there has been a decline to about 50,000 tons. Some of the recent decline in production may have been due to the liquidation of stockpiles by various Governments. The concensus of opinion by members of the Conference was that future prospects were bright, especially if prices of raw materials and electricity were reduced. Such reductions would not have to be of a high order, it was stated, to make magnesium competitive with aluminium.

Outstanding at the Conference was not only the frank exchange of technical data, but also of information about market conditions in the various countries for the sale of magnesium products. Germany has done well in its sale of magnesium for the production of automobile castings, and the UK has made a success of supplying magnesium components to a wide diversity of industries. One market in which it has been found difficult to enter with magnesium is that of the manufacture of containers where cardboard, synthetic-fibre and some of the newer fabrics reign supreme. Suitcases made from magnesium were at one time marketed in the US but had no great success. Thus, it is clear that any increased demand for magnesium—in cast or wrought forms—will probably come from the engineering industries, where low cost of machining or forming the metal seems to be of considerable advantage. It is a pity that the first use of magnesium was for " flashlight " photography and pyrotechnics, because to-day engineers apparently hesitate to use magnesium castings in highly-automatic production layouts because they fear the fire-hazard. However, where good housekeeping is being practised, there is no more danger than when machining any other metal.

Whilst spectacular developments in the use of this light metal are not anticipated, steady progress in the future is to be expected. Any substantial reduction in price would undoubtedly accelerate the metal's use by industry, but as was pointed out at the Conference, much still depends on the acumen of the salesmen to instil confidence in the mind of the buyer. As propaganda for the use of magnesium, last week's Conference was outstanding and should be of lasting benefit.

European Foundry Apprentice Competition

After a week of high endeavour on the part of the 17 contestants engaged in the European Foundry Apprentice Competition—and no less on the part of the judges—results were announced at a dinner on Friday last, as follows:—The team prize went to France with 373.6 marks gained by the three French apprentices, out of a possible 510. Great Britain's team was second with 355.7 and Germany's was third with 302.1. Individually, Mr. R. Flahaut (France) came first with Mr. C. F. Corbett (Great Britain) only six marks behind out of a possible 170. Mr. T. J. Vincent (Great Britain) was third (only a further 8.4 marks behind). Fourth was Mr. S. I. Thornberg (Sweden) and fifth Mr. J. M. Degueldre (France). The European Committee awarded special subject prizes for each of the four sections of the Competition and these were gained as follows:—For practical work, Mr. Flahaut; for technology, Mr. Vincent; for drawing, Mr. J. C. Chandelier (France) and for calculations, Mr. Corbett.

The presentation dinner was held in the Tallow Chandlers' Hall in the City of London by kind permission of the Worshipful Company of Tallow Chandlers. All the competitors were present in addition to the judges and representatives of the training committee of the European Committee of Foundry Associations. Dr. C. J. Dadswell (English Steel Corporation), chairman of the United Kingdom Committee which had organized the Competition this year, presided. The prizes and trophies, in addition to a plaque commemorating the event given to each competitor, were presented by Mr. P. J. M. Thomas, M.P., Parliamentary Secretary to the Ministry of Labour, following a short address to the assembly. Dr. Dadswell proposed the toast of "The Guests," the response being made by Mr. L. Frede (chairman of the European Committee's Training Committee) who was deputizing for Dr. E. Weinberger (chairman of the European Committee)).

Details of the Competition arrangements have been published in the JOURNAL on various occasions and a summary of the events of Competition week together with a full report of the marking will be published at an early date, in addition to further particulars of the prize- and award-distribution ceremony.

Commonwealth Technical Training

"Commonwealth Technical Training Week" is to be held next year from May 29 to June 4 throughout the Commonwealth. Arrangements may take different forms in different parts of the world, but the underlying aim will be the same and the same date will be observed as far as possible throughout the countries concerned. Put bluntly, the object of the Training Week is to show school-leavers the wisdom of learning a trade instead of taking the least line of resistance—meaning a dead-end job. (In the foundry industry, the holding of the European Foundry Apprentice Competition is probably as good an example as could be found for publicizing craftsmanship.) In the planning for next year's "Training Week," during the forthcoming months, every locality will be asked to stage something to propagate the main theme of "learn a trade." No fewer than 45,000 brochures have already been despatched through the agency of the City and Guilds of London to UK educational and civic authorities, industrial organizations, and trade unions, asking for their co-operation. The scheme was devised by HRH the Duke of Edinburgh when in Australia for the Olympic Games, where he was impressed by the efforts being made in that country.

Luncheon

FOUNDRY COKE MERCHANTS ASSOCIATION

The annual meeting of the Foundry Coke Merchants Association, held on Thursday of last week at the Waldorf Hotel, London, was preceded by committee meetings in the morning and by a luncheon attended by members and their private guests. At the latter function Mr. J. William Bell (Renwick Wilton & Dobson, Limited), chairman of the Association, presided, and the company of approximately 50 included at the top table Mr. W. Ruddick, Mr. W. Armstrong, and Mr. G. Smart of the NCB, Newcastle Area; Mr. J. C. Martin of the NCB, South Wales; Mr. E. Tasker (Darby & Company), the immediate past-president; Mr. H. H. Prosser, NCB, Hobart House; Mr. R. J. McDonald, past-president (McDonald Muter & Company, Limited); Mr. C. W. Hardwick of the NCB Hard Coke Association; Mr. W. Pratt of Crook & Company, Limited, and Mr. S. Owen, secretary of the Association. After the loyal toast, the chairman proposed that to "The Guests," referring also by name to several of those who were regular attenders but unable to come this year. The response was made by Mr. Prosser who jocularly remarked that since he had read that morning that the ironfoundry production for 1960 was running at the record rate of 4,250,000 tons per annum there was likelihood of continued success for the Association.

At the annual meeting held during the afternoon of the same day, Mr. Bell was re-elected as chairman and Mr. Tasker as vice-chairman. Retiring member-firms of the committee—J. C. Abbot & Company, Limited, Chas. B. Pugh, Limited, and William Roberts & Sons (Bury), Limited, were re-elected. The next annual dinner (usually held at the May Fair Hotel, London) is to be on February 9, and the annual meeting on May 11, 1961.

Correspondence

"BUSINESS AS USUAL"

To the Editor of the FOUNDRY TRADE JOURNAL

SIR,—Your leader in the JOURNAL of May 19, under the above title, makes some valid points on the difficulties in which many foundries find themselves as a result of the call-up of young craftsmen just out of their apprenticeship. The CFA has had a number of such cases brought to its notice, and has intervened on behalf of the companies with the Ministry of Labour.

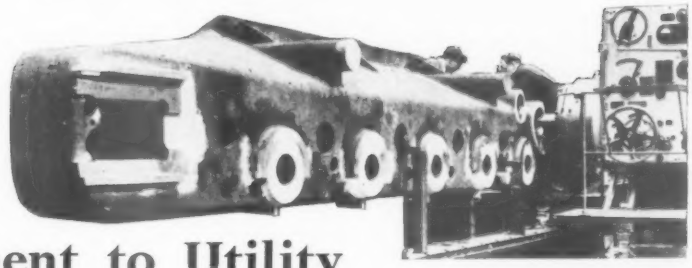
There is, however, one reference in your article which may prove to be misleading to some readers. You mention the offer of training during the first year of apprenticeship which the Ministry of Labour is providing free of charge at a number of their training centres.* We have been informed by the Minister that no training in foundrywork or patternmaking will be provided in any of these centres. The Minister therefore supports the action of the Trustees of the National Foundry Craft Training Centre in appealing for a capital sum for building a new modern training centre for the foundry industry.—Yours, etc.,

F. C. HAYES,
Education and Training Officer,
Council of Ironfoundry Associations.

Crusader House,
14, Pall Mall,
London S.W.1.
May 20, 1960.

* The Editor was aware that foundry apprentices were not included in the Ministry of Labour Scheme, but thought it germane to refer to this effort.

Progress from . . .



. . . Ornament to Utility

Survey of Midland Works to be visited during the Institutes Malvern Conference

In the week commencing June 20, 15 separate establishments in the Midlands area are to be visited by parties of the Institute of British Foundrymen during the run of their conference at Malvern, and the following accounts give a preview of operations carried on in these works, and some idea of types of castings handled. Readers who are familiar with the way in which Birmingham-area industry has progressed from a centre for world supplies of ornamental metal smallwares in the 18th and 19th centuries to its eminence in light and heavy engineering to-day, will need no explanation for the choice of title for this composite article. Foundries naturally have followed this same line of progress, and the old dictum that the Midlands produces "everything from a pin to a steamroller" is well epitomized among the establishments to be viewed by the visitors. Traditional hospitality will also be dispensed.

Sterling Metals, Limited

Sterling Metals originated in Coventry during the year 1907. The company began business on a small scale (about 20 people were employed), as one of the first producers of aluminium castings for the new and growing motor industry. In this field, they were pioneers and from the beginning aimed at high-quality production. In 1910, the Northey Road Foundry was built at Foleshill, Coventry, to house the growing aluminium business and also to begin the specialized production of cast-iron motor cylinder-blocks and-heads. The latter was again of a pioneering nature, as it is believed that, up to that time, no foundry had established itself independent of the motor manufacturers, solely for the production of these castings. In 1921, the company took what proved to be one of the major steps in its history when it acquired the British manufacturing rights for the production of "Elektron" magnesium-alloy castings.

Sterling Metals had done much towards the development of high-quality aluminium castings, but this is quite overshadowed by the firm's early work in the development of magnesium as a constructional material for the aircraft and allied industries. By 1929, magesium-alloy castings were being produced in bulk, and the rapidly-growing aircraft industries became the prime users of the metal. In addition, there was an ever-widening field of application for magnesium in the commercial market, and it was soon apparent that larger premises were needed. The Board acquired a large area of land on the outskirts of the neighbouring town of Nuneaton and, in 1939, the building of a new magnesium foundry was started on this land. This new foundry at Nuneaton was ready for production in October, 1940, two weeks before the parent department at Coventry was destroyed by enemy action during World War II. A gradual transfer of other sections from Coventry to Nuneaton has taken place since 1946, and now only a part of the gravity-die department remains at Coventry.

Nuneaton Works

At Nuneaton, the present works cover some 30

The illustrations at the head of this article well show the progress made over the years among Midlands Area founders. Everyone knows Birmingham's reputation for selling ornamental ware all over the world during the 19th century, and the decorative cast-iron lamp stands shown are typical of this type of product in the cast-iron field. They were made by John Harper & Company, Limited, of Willenhall, one of the works which is to be visited during the Malvern conference. In contrast, the second illustration, of an 18-ton excavator casting in steel, made recently by F. H. Lloyd & Company, Limited, of Wednesbury (another of the firms receiving parties of IBF members), is a good example of the change to more serious and substantial productions which now take the major share of Midlands industrial output. The excavator casting is shown being machined at Lloyd's works on a Skoda horizontal borer. Nowadays, of course, John Harper's also have changed their scope to include grey and alloy iron castings for hundreds of different industries, as is indicated later in this article.

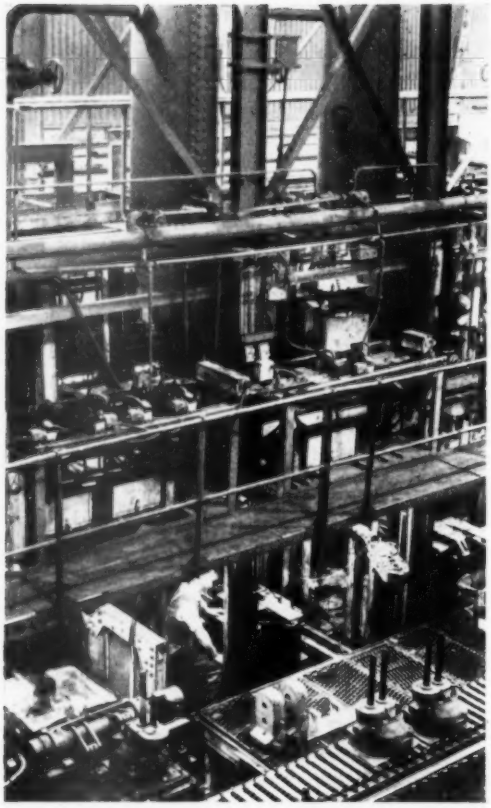


FIG. 1.—*Vertical view over three tiers of CO_2 core production in the mechanized iron foundry of Sterling Metals, Limited, at Nuneaton.*

acres and employ approximately 2,500 people. There are four main production departments, these being the iron division, magnesium division, aluminium division, and gravity-die division.

Iron Division

The iron division at Nuneaton is a highly-mechanized foundry for the bulk production of automobile, commercial-vehicle and tractor cylinder-blocks and-heads, transmission casings, etc. Melting is carried out through a battery of four hot-blast cupolas, each capable of melting 10 to 12 tons per hr. of high-duty grey iron (B.S.S. Grade 14-17). The moulding shop comprises six separate units—five mechanized plus one jobbing. Four units are equipped with Herman Stationmaster indexing machines, and one unit is a Sandslinger turntable unit. The coreshop practice includes traditional oil-sand practice, CO_2 cores (Fig. 1) and resin-bonded cores. A pendulum conveyer services all production units in the foundry, cools the castings by outside circuit and finally passes through the fettling shop.

Magnesium Division

The original foundry, built on the Nuneaton site in 1939/1940, is to-day the main magnesium foundry. Work is mostly on a jobbing basis, but two Sandslinger units deal with the larger runs. The shop is mainly used for the production of aero-engine (Fig. 2) and aircraft castings in magnesium/zirconium, rare-earth and Thorium alloys. Commercial-vehicle engine and chassis castings, textile high-speed warp beams and bobbins and magnesium-alloy castings for many other applications are also produced in this shop. Jolt/squeeze and rollover type machines are used where quantities merit this equipment. All cores are produced via CO_2 Process. Metal is melted in deep-drawn mild-steel ladles of up to 600-lb. capacity in oil-fired furnaces.

Aluminium Division

The aluminium division of the works produces, in a wide range of alloys, a large variety of aluminium castings, weighing from a few ounces to 1,300 lb. each. Moulds are made by hand, jolt/squeeze machines and a Sandslinger unit. The bulk of the cores are produced by the CO_2 Process. The aluminium and magnesium fettling shops are housed in a building separate from the foundries, and are divided by an inspection department which is common to both.

FIG. 2.—*Napier "Eland" reduction-gear casing in magnesium/zirconium alloy R.25. Weighing* 164 *lb., this casting is quite typical of the size range produced in the jobbing section of Sterling Metals' magnesium foundry at Nuneaton.*

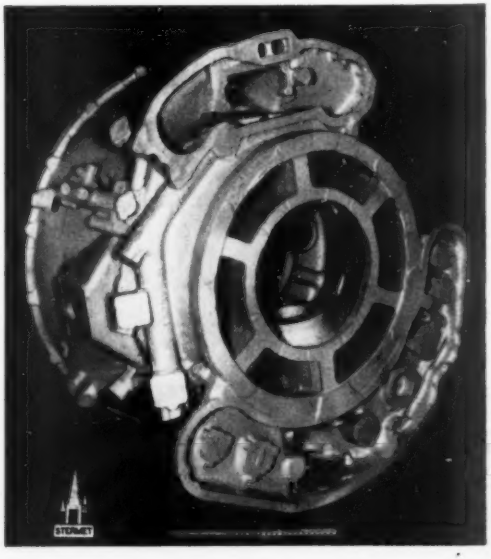


FIG. 3.—*Part of the well-laid-out patternshop at the Tame Bridge foundry of W. & T. Avery, Limited. Note the arrangement of benches at the sides, with certain machine-tools, surface plates, etc., in the centre of the shop.*

Gravity-die Division

The company's activities in the gravity-die field are divided between two foundries, one of which is still situated in Coventry. A new gravity-die foundry is in process of being developed at Nuneaton Works to which, finally, the whole of the company's gravity-die-casting activities will be transferred. At the present time, bulk production of aluminium gravity-die-castings for the motor trade is in being at Nuneaton; plant layout will not be completed for some nine to twelve months.

Other Departments

Two laboratories exist at Nuneaton Works—one for the light-alloy division and one for the iron division. The light-alloy laboratory includes a large X-ray department. A small section exists for the production of close-tolerance castings, produced by the Antioch plaster process, shell-moulding and CO_2 Processes. Ancillary departments include patternshop, tool-room (at Coventry Works), engineering department, etc.

Welfare facilities include a large works canteen of modern design, a fully-equipped medical department with own X-ray facilities, a modern ablutions block (iron division) and thriving social club. Pension schemes exist for employees, and the company operates a comprehensive apprenticeship scheme (62 apprentices at the present time). There is a self-contained personnel-management departmnt under a full-time personel manager.

W. & T. Avery, Limited

The Avery foundry at Tame Bridge near Walsall is the successor to the Soho Foundry which was built on the borders of Birmingham and Smethwick in 1796 by Matthew Boulton & James Watt, and was acquired by W. & T. Avery, Limited, a hundred years later.

In the next 60 years Avery developed Soho Foundry in such a manner that it became the most self-contained plant in the world for the production of scales, weighing equipment and testing machines, but even its 25 acres of fully-equipped factory space proved inadequate to meet the heavy demands which fell upon it during the years immediately following World War II. Thus, in 1946, Avery acquired a new factory site at Sherburn-in-Elmet near Leeds. Here modern plant was installed for the manufacture in quantity of scales for the retail trades and the lighter types of industrial weighing equipment. The foundry, built to produce 80 to 100-tons of castings a week, was fully mechanized for repetition production of grey-iron castings. Even with the support of the Sherburn Works, however, it became apparent that the resources were inadequate. The physical layout of Soho Foundry was also unsuitable for development. Accordingly, a former Royal Ordnance factory at Tame Bridge was purchased. It covered 122 acres and is destined to become the Avery No. 1 works, and administrative headquarters.

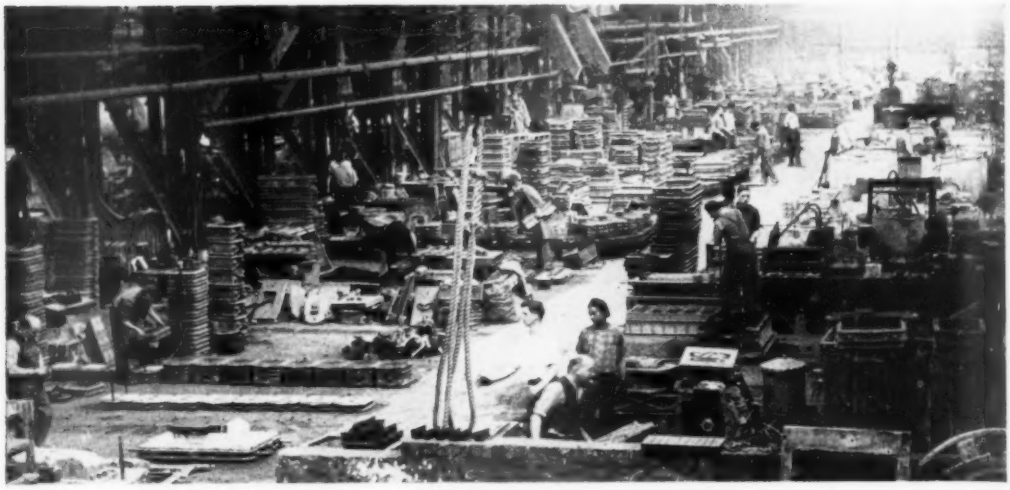


FIG. 4.—*General view of the sand foundry of Birmingham Aluminium Casting (1903) Company, Limited; note the clear central gangway running the whole length of the shop.*

Tame Bridge Foundry

The nucleus of this new works is a grey-iron foundry and patternshop which has been built at an initial cost of £1,250,000 and is now fully operational. Designed for an output of 240 tons per week of casting ranging in weight from a few lb. to some eight tons, the foundry (which uses green sand only) produced its first casting in 1954. The bulk of the output is for Avery weighbridges, platform-scales, testing machines, and the many and varied items of light castings not suitable for production by the mechanical plant at Sherburn. At the same time, however, a steady business is being built up in the production of medium-weight castings for "outside" customers in the engineering industry. The over-riding policy at this new foundry is to make use of mechanical aids and to conserve skill, rather than to operate a mechanical plant; the key-note is "flexibility." All processes are carried out under one roof in a very solidly constructed building designed especially to provide excellent working conditions.

Subsidiary Building

Recently, a small subsidiary building has been erected on the east side to house the heavy sand-plant and to provide storage for approximately 500 tons of backing sand. Although a little remote from the foundry, this building is connected to it by a covered conveyor. By virtue of this additional building, potential output of castings has been raised by 50 to 60 tons per week and a source of foundry atmosphere dust pollution has been reduced. Two original powder magazines—relics of the former Ordnance Factory—have been converted for the storage of patterns and a third magazine has been adapted to provide a well-equipped boiler house, compressor chamber and equipment store.

The main building is 510 by 300 ft. covering an actual area of 168,000 sq. ft. Main bays are each 60-ft. wide, four of these house the moulding and coremaking sections, while two others—running at right-angles—contain raw-materials storage and melting plant in the one and dressing and painting facilities in the other. All gantries have been con-

FIG. 5—*Gravity-die-casting foundry; each operator is supplied with metal from individual holding-furnaces (Birmingham Aluminium (1903) Company, Limited).*

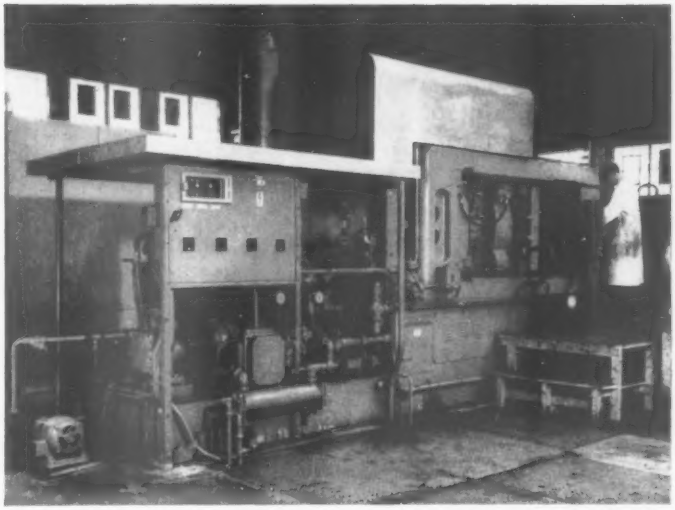


FIG. 6—*Large machine in the "heavy" pressure-die-casting department of the Birmingham Aluminium Company's works.*

structed of sufficient strength to carry cranes of 20-tons safe-working load, although in many cases cranes of lighter capacity have been installed.

A well equipped patternshop (Fig. 3) and sundries store is accommodated in a bay 40-feet wide and parallel with it, and forming the front of the building is the office block containing offices, laboratory (for routine analysis and sand testing), cloakroom, showers, and mess-room.

Melting

There are two cold-blast cupolas, each melting 9-tons per hour and each fitted with a constant air/weight controller. Each cupola is mechanically charged, has a water-wash spark arrestor and is arranged for continuous slagging and granulation. These cupolas serve an oil-fired tipping receiver of 8,000-lb. capacity and electric trucks transport ladles to and from the cupolas. Weights of individual ingredients of the charges, as well as weight of hot metal distributed, are recorded on paper tapes.

Moulding

The majority of moulds are rammed up by Sandslinger, but there is one section in which "short-run" light castings are made on moulding machines, most of which are hand-operated. Of the Sandslingers, three are of the stationary type, while a fourth—which has a 25-ft. arm and a ramming capacity of 2,000-lb. of sand per min.—is mobile. The "pattern-flow" system of moulding is practised extensively and one unit (designed specifically for Avery products) has resulted in a three to one increase in output per man over traditional methods. Three heavy shake-outs are installed, the largest, which feeds the heavy sand plant already mentioned, having twin tables 16-ft. by 10-ft. and a capacity of 20 tons. This plant has a throughput of 90-tons per hour. Moisture at this point is controlled, automatically, by a recently installed "Hygrotester," operated by a quartz-electrode capacitance unit, and a temperature probe which embodies electronic valves and servo-motors.

Dressing

A feature of the dressing section is an impeller type shotblast machine which has a retractable revolving table. Castings are dressed by hand-chippers and grinders—tools which are plugged into posts each carrying three services: high-cycle electric current, compressed air and vacuum. The majority of castings are spray-painted, before despatch from the works.

General

A planning section is equipped to utilize modern time and motion study techniques and on the wall of this office is an "Autovisor"—an instrument equipped with ten pens recording on a moving chart. These pens are connected through electric relays to key units of the plant such as cupola blowers, sand mixer, Sandslingers and so on. The operation of the plant, at any time, can thus be seen at a glance and a daily record of plant utilization is readily provided.

W. & T. Avery, Limited, have long been proud of, and have indeed enjoyed local renown for the thorough training and encouragement given to the company's apprentices. Annual awards are made to those who obtain ordinary and Higher National Certificates (or equivalent City and Guilds) of London Institute examination successes, and it can be added that in recent years the total of these cash awards has exceeded £1,000. With a flourishing apprentices' section at Tame Bridge, recruitment is no longer the serious problem it used to be.

Birmingham Aluminium Casting (1903) Company Limited.

The works of the Birmingham Aluminium Casting (1903) Company, Limited are situated just outside the Birmingham City boundary in the urban district of Smethwick. As can be seen from the title of the company, it has been in existence for nearly 60 years. On its incorporation at the turn of the century, the works were situated in the centre of Birmingham on ground which is now utilized as part of the new Birmingham Civic Centre, the move being made from that site to

FIG. 7.—*Tapping and weighing of Meehanite from a water-cooled cupola at John Harper & Company, Limited. Note the use of a tip-up spout, which serves as a reservoir as ladles arrive in turn, and the use of a long delivery tube for the mechanical feeding of late additions to the metal at the spout.*

the existing one in 1921. Originally, the firm was one of two companies in this country who specialized in aluminium castings. The company was founded in the early development period of the British automobile industry and the development in those days went hand in hand with developments in automobile production. At that time, sand casting was practised.

Process Development

The first process development took place about 1912 when the methods of producing castings from gravity dies were introduced from France. The introduction of this process naturally created considerable interest among the automobile manufacturers and development was quite rapid. Sand casting and gravity-die-casting continued in parallel for a number of years until 1927, when machines were installed for the pressure-die-casting of aluminium alloys. From that time, to the present day, sand founding (Fig. 4), gravity- (Fig. 5) and pressure-die-casting (Fig. 6) have been the principle methods of production employed by the company—aluminium alloys being the main materials employed. The introduction of magnesium alloys and zinc alloys have, however, taken place during the period named.

Whilst throughout the years, the automobile industry has demanded a considerable amount of the company's production, situated as the firm is in the heart of the industrial midlands, not one industry has monopolized the production of the works—all industries having been catered for to a greater or lesser extent.

The Birmingham Aluminium Casting Company is included in the main Birmid apprentice scheme and at the present time, 18 technical apprentices are enjoying the full sandwich course with 36 craft apprentices. As would be expected with a company of this age, there is considerable long service and the "25 Club" in one section of the works has 70 members—all of whom have at least 25 years' service with the firm.

John Harper & Company, Limited

Willenhall, in the Staffordshire "Black Country," has always been a centre of the lockmaking industry, and the firm of John Harper & Company, which was founded in 1790 during the Industrial Revolution, was originally a lock and bolt manufacturing concern. During the nineteenth century, the products diversified to include a wide range of hardware, and a foundry department was formed. The foundry eventually began to make castings for outside customers as well as for Harper's own products and in this way arose the present arrangement of a foundry department closely associated with a finished-goods department, which to-day makes not locks, but gas and oil appliances and other domestic hardware—often sold under the trade mark "Beatrice."

During the visit, members of the Institute will have the opportunity to visit the company museum where many examples of intricate decorative castings made 100 years ago are preserved, and also will be able to see the press shop, assembly shops, painting and vitreous-enamelling shops of the finished-goods department.

Foundry

However, foundrymen will naturally be more interested in the foundry section. This has capacity for the production of about 300 tons of castings each week, of which only a small proportion are processed in the finished-goods department. This tonnage is made up principally of light castings—the maximum weight cast being of the order of one ton, but most of the production consists of castings of less than 100 lb., made for a wide range of industries. The foundry employs about 650 people (out of a total of 1,300). There is a considerable number of highly-skilled craftsmen making work of a specialized character and, in addition, many semi-skilled machine moulders are engaged in the production of repetition work.

As well as Englishmen, people from India, Pakistan, Jamaica, Italy, Germany and Poland are working together in the foundry. Labour relations are particularly good—in all the 170 years of the firm's existence there has never been a strike.

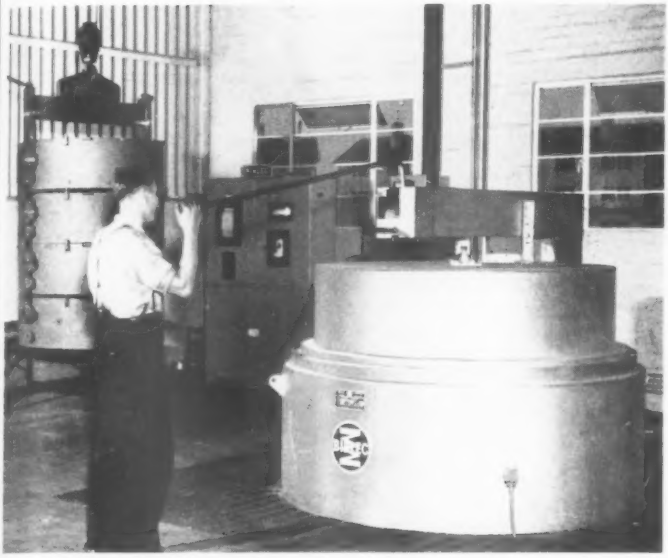


FIG. 8.—*A comparatively recent addition to the plant at John Harper's is this pit-type Birlec heat-treatment electric furnace. This is housed in a new shop where a second furnace is shortly to be installed.*

Castings are made in three main types of iron: phosphoric grey iron, Meehanite high-duty irons, and spheroidal-graphite iron. With the exception of a small rocking-resistor electric furnace (primarily for experimental work), melting is carried out in a series of cupolas. All of these are internally water cooled (Fig. 7) (see FOUNDRY TRADE JOURNAL, May 7 and 14, 1953). One pair of small cupolas is operated on hot blast, using a modified Schack type of recuperator, and there is also a basic-lined cupola for the melting of low-sulphur iron for the production of spheroidal-graphite castings. Visitors will see the various types of material being melted and also will be able to visit the laboratory where this process is controlled. Equipment which will be demonstrated here includes a Dennison Universal testing machine, a Vickers projection microscope, a Fuess spectroscope, an electrical-resistance meter and other standard chemical, physical and metallographic apparatus.

Moulding

Most of the foundry production is in green sand. One mechanized plant operates on a synthetic sand system, but the company has its own quarry of local red natural sand which forms the basis for unit, facing and backing sands in most sections of the works. The practice of drying moulds for the larger castings has in all but a few specialized cases been superseded by the use of the CO_2 Process—which is not however considered suitable for much of the core production. Cores are mostly of the conventional oil-bonded type and are made on a range of coreblowers and "shooters" as well as by hand. The use of shell cores (as opposed to shell moulding) has been found economical on certain classes of work and "Shalco" machines which have been adapted for production of these cores will be seen. John Harper & Company have always had a reputation for "the Harper Skin" and the maintenance of a fine finish is an important part of the technical control in the works. The pattern equipment used varies with the type of work concerned; wood, aluminium, gunmetal, cast iron and, increasingly, epoxy resin plastic are all in use and are made and maintained in the well-equipped patternshop.

Mechanization

Since the firm is involved in the production of

FIG. 9.—*Beardsley Piper design of motive-type Speedslinger in the jobbing steel foundry of F. H. Lloyd & Company, Limited. The operator is himself carried on the swing arm, where he operates joy-stick controls to direct the flow of sand into the box.*

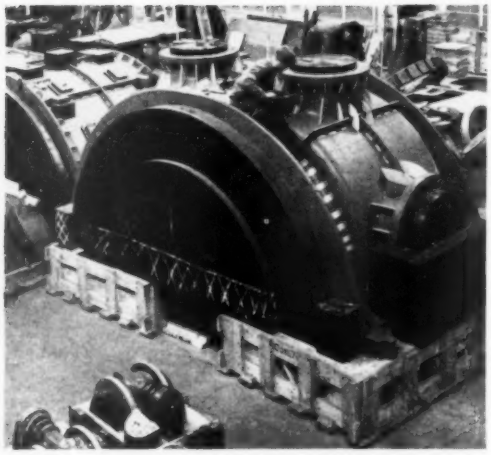


FIG. 10.—*Patternmakers at work on a large and complicated job at Lloyd's, where the shop caters for a large proportion of the foundries' requirements.*

such a wide range of work (a wide range metallurgically, in size of casting, and in production requirements) a unified system of mechanization has not been practicable. The existing foundry was built in the 1930's and incorporates a certain amount of mechanical handling, especially in the pneumatic and hydraulic moulding-machine sections, but more interesting from the production engineer's point of view are the three separate mechanized plants (each suited for a different range of work) which have been installed since the war. The dressing-shop layout has formed the subject of an article in this JOURNAL (October 18, 1956) although it has been modified since that time to suit increasing and changing production. Most of the s.-g. iron and some of the grey iron made has to be heat-treated and a new shop containing one (and shortly a second) pit-type Birlec electric annealing furnace (Fig. 8) will be seen during the visit. The company looks forward to welcoming the visitors and hopes that the visit and discussions will be interesting and valuable to all their guests.

F. H. Lloyd & Company, Limited

F. H. Lloyd & Company, Limited, steelfounders and engineers, is a public company with its registered office at James Bridge Steel Works, nr. Wednesbury. The company has three foundries—F. H. Lloyd at James Bridge, Lloyd's (Burton), Limited, and Parker Foundry at Derby.

To-day, the Wednesbury plant alone occupies some 36 acres and has an employee force of over 1,800. The annual output of steel castings from these works in 1912 was 2,000 tons, but to-day, it is in excess of 20,000 tons. At Wednesbury, castings in a large variety of steel grades are produced up to 30 tons in weight, and a great deal of modern foundry equipment has been installed in the foundries in recent years. This equipment includes Beardsley Piper sandslingers (Fig. 9), a mechanized coremaking layout and a Badische Slinger rollover plant. In the fettling shop, visitors will see a Tilghman's shotblast plant and also of interest will be the 60 Curie cobalt unit radiographic equipment which is used extensively in the non-destructive testing of castings. The firm's own patternshop is equipped to produce all sizes of patterns needed in the works (Fig. 10).

Machine-shop

On the engineering side the company's machine-shop has a comprehensive range of machine tools which can cope with the machining of any castings that are produced in the foundry. Of special note in this connection are a Skoda 30-ft. double ram borer, a Froriep 20-ft. and a Berthiez 20-ft. vertical borer, a Scottish 20-ft. wall planer, a Craven 20-ft. moving lathe planer, and a Craven 16-ft. vertical borer.

The melting capacity at the Wednesbury works consists of two 10-ton basic electric-arc furnaces, two 5-ton basic electric-arc furnaces, two 5-ton acid electric-arc furnaces and two high-frequency induction furnaces. Fully-equipped laboratories are at hand to ensure strict analysis control at all stages.

Welfare and Training

The company has a canteen, fitted with all modern equipment, to provide meals for the employees. There are also ample facilities for indoor games, football pitches, bowling green and tennis courts. The medical block is equipped with radiographic equipment to take X-ray photographs and it is a condition of employment that every employee must be radiographed and medically examined every 12 months. The department also has an eye clinic which is also used by neighbouring firms.

In the field of training, the company has a central training headquarters at Bourne House, near the works. This is the administrative headquarters of the training department and contains all facilities for training. The foundry training school in the works can accommodate 18 apprentices and the engineering training school is equipped to accommodate 12 apprentices. At present, approximately 50 foundry and 50 engineering apprentices are being trained at Wednesbury. In passing, it is also interesting to note that the foundry training school was the venue for the practical tests in the recent European Foundry Apprentice Competition.

The company also arranges potential supervisors' courses of 18-months' duration and a series of lectures are held during the winter months covering a wide field. In the field of non-vocational training for apprentices, mountaineering, camping and sailing courses are held at frequent intervals.

CHAIRMAN FOR THE coming season of the recently formed Midland Society for Quality Control is Mr. R. K. Grunau, of Rolls-Royce, Limited.

National Society of Master Patternmakers

Annual Meeting and Social Event, at Brighton

The Grand Hotel, Brighton, was selected by the National Society of Master Patternmakers as the location for their sixth annual general meeting and social event over the weekend, May 21-22. It proved an admirable selection of venue despite cool weather which somewhat lessened the attraction of a seaside resort. Nevertheless, there was a very good attendance of members, many of whom were accompanied by their ladies. The business meeting was held in the afternoon when after the routine of apologies and Minutes, the retiring president, Mr. W. D. Hartley (Fellows & Darby, Limited) reviewed the activities of the Society during the past year. He dwelt briefly on the increased strength of the Society and mentioned new members who had joined during the year. The various activities in which the Society had participated—works visits, business collaborations and social functions—were reviewed in some detail and the president concluded by outlining the arrangements for the forthcoming visit by members to kindred establishments in Italy.

Photographs taken during the annual dinner in Brighton of the National Society of Master Patternmakers. On the left are Mr. E. C. Rowen and Mrs. Rowen, the new president and his wife, who received the members and guests; the two centre illustrations are of groups taken informally during the dinner (showing part of the top table at the rear of each and Mr. M. J. Glenny, the chief guest, at top left and Mr. Stansby (past-president) and Mrs. Stansby, facing camera, bottom right); in the lower pair (left to right) are Mrs. Brown, Mr. L. Brown (past-president), Mrs. Faulkner, Mr. W. D. Hartley (the retiring president), Mrs. Levy and Mr. B. Levy (past-president).

National Society of Master Patternmakers

Election of Officers

Continuing the business of the meeting, accounts for the year ending December 31, 1959, were presented along with the budgeted expenditure for 1960 and the meeting then proceeded to the election of office bearers for 1960/61. Mr. E. C. Rowen (Pattern Equipment Company (Leicester), Limited) was made president and Mr. R. W. Mousley (Leamington Pattern Company) was made senior vice-president. As new members of Council, Mr. S. Shaw, Mr. W. J. Crockett and Mr. W. Wilkinson were elected and as auditor, Mr. A. Whitehouse of Coventry was re-elected. At this juncture, the president took pleasure in announcing the granting of honorary membership of the Society to Mr. Whitehouse who has been honorary auditor since its formation. The secretaries, Fisher & Firkins, 12, Cherry Street, Birmingham, 2, were thanked from the chair for their efficient services over the year. At the conclusion of the meeting, a vote of thanks to the retiring president was warmly accorded, following its proposition by Mr. V. C. Faulkner.

Annual Dinner

The annual dinner of the Society, held at the Grand Hotel, proved a very pleasant event attended by approximately 80 representatives of member-firms, their guests and ladies. After the Loyal Toast, that of "The Society and the New President" was proposed by Mr. Hartley. For the benefit particularly of the ladies and to show the guests the nature of the Society's activities, he dwelt briefly on events of the past year, saying that after its six years of progress, all the members and officers could be proud to realize what a "live" body it had become and how fully it represented master patternmaking in the United Kingdom.

Concluding his remarks, Mr. Hartley said that whilst he himself was joining a quite illustrious fellowship of past-presidents, he had every confidence that in Mr. Rowen the Society had a new president who would bring wise leadership to its affairs. The reply was made by the new president, who expressed the hope that he would be able to live up to the high standard set by his predecessors. Mr. Mousley proposed the toast "The Guests" (which included the ladies) and Mr. M. J. Glenny (chairman of the Council of Ironfoundry Associations) replied. Dancing then continued until midnight, all agreeing at the close that it had proved a most friendly gathering.

Anglo Polish Trade Agreement

Representatives of the British and Polish Governments have signed a new trade agreement providing a basis for trade for the three-year period beginning on July 1. Quotas for the 12 months from July 1, envisage an increase in UK exports from £16,500,000 in 1959 to about £20,000,000 and an increase in Polish exports from about £33,000,000 in 1959 to about £35,000,000.

Included in the quota list for UK exports to Poland are capital goods, machinery and equipment.

IRON TRADES EMPLOYERS INSURANCE ASSOCIATION, LIMITED—Sir Charles Connell has been elected chairman of the company and of the subsidiary, the Iron Trades Mutual Insurance Company, Limited, in succession to Mr. F. C. Pyman who has resigned. Sir Greville S. Maginness remains vice-chairman of both companies.

Britain should join the Six—ECSC Chief

Rapid steps should be taken to draw Britain closer to the Inner Six, said Mr. Dirk Spierenburg, senior vice-president of the High Authority of the European Coal and Steel Community, in an address to the European Movement at Zwolle, Netherlands, on Saturday. The goal should be full British membership of the Common Market, he said.

"Let the Six take a positive attitude," he declared. "They should not fall back on the same reserved and negative attitude which for so long marked British policy towards the Six. Let our British friends speedily have the courage and the vision to take the major step towards the European Economic Community."

Mr. Spierenburg said that Britain should regard negotiations with the Six not purely as an economic step. She should also recognize the political significance of integration, and particularly her role in binding Germany firmly to the West. Once Britain took this hurdle, the Six should not hesitate, he declared. "They should accept negotiation on British membership with a positive and constructive approach."

John Thompson Dividend cut

Announcing a final of 12½ per cent., John Thompson, Limited, combustion and general engineers, of Wolverhampton, is cutting its dividend from 25 per cent. to 20 per cent., although the decrease is not as great as was feared. Trading profits fell from £1,742,336 to £1,331,642, before tax of £457,495 (£736,868).

The report says that an overall loss is ultimately expected on the Berkeley nuclear power station contract. No provision has been made in the accounts for this loss, but while the overall loss cannot yet be assessed, £500,000 has been set aside in a special reserve to cover John Thompson's share of the loss that may be incurred by AEI-John Thompson Nuclear Energy Company, Limited.

Cambridge to end Engineering Proficiency Certificate

The faculty board of Cambridge University has urged the discontinuation of the Certificate of Proficiency in Engineering Studies and the associated examination in engineering studies, with effect from 1963. It has done so because the number of undergraduates at present entering the Engineering Department with the intention of reading for the certificate has become negligible.

The board states that the regulation for the certificate should be rescinded without hardship to any prospective candidate if Section I of the examination were to be held for the last time in September, 1962, and Section II in September, 1963. The Financial and General Board of the university offers no objection to the proposal.

TO ACCOMMODATE increasing staff, Steels Engineering Installations, Limited, has constructed and occupied a new office block at Crown Works, Sunderland. The company, a member of the Steel & Company, Limited, group, has substantially increased its technical and commercial staff by the creation of a gas cleaning division and a pressure-vessel and heat-exchanger division.

Vokes Group Exhibition

Last month, Vokes Group, Henley Park, Guildford, Surrey, held an exhibition of their products at the Kensington Palace Hotel, London, W.8. This was a continuation of a series of exhibitions which are being held at well-spaced intervals in the principal cities of the UK. This type of travelling exhibition has proved a useful means for the firm to display its products. As the firm caters for a large number of different industries, it is stated that no established exhibition would serve so well.

Tool Support

For founders, one of the most interesting exhibits on show was the Vokes Genspring universal tool-support. In this design, a spring takes the load instead of a counterbalance, when the device is applied to the support of portable tools to avoid operator fatigue. Applications would seem to include support of portable grinders, cut-off machines, pneumatic rammers and chisels and other similar types of heavy manually- or power-operated tools.

Other Exhibits

Other exhibits were a selection of transparent-bowl compressed-air-pipeline filters for ¼-, ⅜- and ½-in. lines, and an interesting air-filtration unit, known as the "Renovair," which, it was said, will even take out tobacco-smoke and bacteria from works or office atmospheres. Equipment which made up this portable exhibition included Genflex bellows expansion-joints for pipe lines, SC automatic rotary-screen air-filters and a display panel for radiant-heat continuous ovens, which, for example, might be applied for "biscuit" drying when vitreous enamelling. The latter are manufactured by Rayheat (Process Plant), Limited—one of the Vokes group of companies.

Vacuum Furnace for Magnet Association

A 12 to 17 lb. (steel) capacity vacuum-induction furnace for the Permanent Magnet Association is at present under construction in the works of Wild-Barfield Electric Furnaces, Limited, of Watford. The equipment can be used for melting, alloying, casting, sintering and degassing. It will, however, be used primarily for melting *in vacuo* aluminium/nickel/cobalt/iron alloys for research work into permanent-magnet materials. The vacuum chamber is of stainless-steel, 30 in. dia. by 32 in. long, mounted horizontally, and ancillary equipment includes mechanism for viewing, charging, alloying, pouring, cover-lifting and bridge-breaking. The pumping system is capable of obtaining pressures down to 0.5 microns. A unit generally similar to the one described will be on the manufacturer's stand —No. 120, National Hall—at the forthcoming International Machine Tool Exhibition at Olympia (June 25 to July 8).

FOUNDRY APPRENTICES of F. H. Lloyd & Company, Limited, Wednesbury, who were spending a week-end mountaineering in North Wales, were able last Saturday to assist in a mountain-rescue operation. A small party of climbers had suffered an accident on Crib Goch, one of the Snowdon range, and the apprentices were able to form a chain for passing blankets, stretchers and other equipment up to the rescue workers. The party of 25 Lloyd's apprentices were attending the mountain camp as part of their normal training curriculum.

Balfour Group's Research Centre

Mr. John S. Maclay, Secretary of State for Scotland, on May 27, opened the £250,000 research and development centre of the Henry Balfour group of companies at Leven, Fife. The centre, which incorporates pilot plant and laboratories, embodying all the main types of processes and equipment in use in chemical industries, has been built by the group for the Balfour Scott & Enamelled Metal Product Companies.

A function of the centre is the provision of training facilities in chemical engineering. The provision of pilot plants will mean that before manufacturers are involved in irremediable expense in installing full-scale plant, they will be able to make use of the facilities provided for the analysing, testing and evaluation of complete processing systems in terms of size, output and operation. Integrated with the pilot plants are laboratories for research work on the design and operation of chemical process plants and the use and manufacture of constructional materials.

The company has more than 1,200 employees and the works at Leven are equipped to produce anything from a small component to a complete plant. With the extension of the boiler-shop behind the new buildings it is anticipated that about 250 more employees will be needed within two years.

Anglo Soviet Trade Agreement

The Board of Trade announce that a delegation from the Soviet Union will be arriving in this country on June 6, to begin discussions with the Board of Trade on the following day about the operation of the Anglo-Soviet Five Year Trade Agreement of May, 1959. Article 5 of the Five Year Trade Agreement provided that representatives of the two Governments would meet at least once a year, alternately in London and in Moscow, to examine the carrying out of the provisions of the agreement and, if necessary, to prepare recommendations to one or both governments for the further improvements of trade relations between the two countries.

The Board of Trade have been informed that the Soviet delegation, which will be coming to London for these discussions will be led by Mr. P. N. Kumykin, a Deputy Minister of Foreign Trade in the Soviet Union. The United Kingdom delagtion will be led by Mr. F. J. Erroll, MP, Minister of State in the Board of Trade.

Elijah Hepworth Commemoration

The governing body of the Bradford Institute of Technology have accepted an offer by Hepworth & Grandage, Limited, the Bradford engineering firm, of a gift of £2,000 as a commemoration of the life and work of the late Elijah Hepworth, a son of the founder of the firm. The income from the gift will be used to provide prizes for students at the Institute taking courses leading to the diploma in technology in engineering, or in metallurgy, or in industrial organization. The awards will be known as "The Elijah Hepworth Prizes." Mr. Hepworth, who was the youngest of the eleven children of Mr. Elijah Hepworth senior, was chairman and managing director from 1954 until his death in 1957, thre months before the firm's jubilee.

A TEAM OF MASSEY-FERGUSON EXECUTIVES, led by the marketing director, Mr. L. H. Pomeroy, left the Coventry factory on May 24 for a 10-day helicopter tour of the company's distributors in the UK.

Equipment and Supplies

Vacuum Melting Furnace

The General Electric Company, Limited (Engineering Group, Witton, Birmingham), in association with Vacuum Industrial Applications, Limited, has received an order from the British Steel Castings Research Association for a vacuum melting and casting furnace (Fig. 1) for the Association's experimental foundry at East Bank Road, Sheffield. The furnace has a 36-in. dia. chamber, mounted horizontally, and is claimed to be capable of melting 56 lb. of steel. The working pressure of the furnace chamber is 1 micron Hg., and a working temperature of up to 1,700 deg. C. can be achieved. Casting equipment can be mounted within the chamber: the melt is poured by rotating the crucible unit about its lip axis. The horizontal arrangement (as well as facilitating the cleaning of the interior, the crucible, and fittings), is convenient in that moulds can be located near the door, being thus readily accessible. Two dip thermocouples are provided for temperature measurement, and the chamber also contains a scull-breaker and a removable crucible-lid. Alloying additions are carried in six tipping buckets in the top of the chamber, and fed to the crucible by means of a removable chute, the appropriate addition being selected by a rotary indexer.

Evacuation

The chamber is evacuated by means of a two-stage pumping system consisting of an oil booster-diffusion pump backed by a gas-ballasted rotary pump. The booster pump is of 10-in. throat dia., and has a three-stage jet system. Its peak speed is 4,700 cub. ft. per min., whilst the backing pump has a displacement of 47 cub. ft. per min. The combined speeds of the pumps give a high throughput over a wide pressure-range, sufficient, it is claimed, to maintain the chamber pressure even under conditions of severe outgassing of the charge. The charge is heated by induction, power being supplied by a 4-kc/s 50-kva motor/alternator, and the input controlled from a control cubicle adjacent to the furnace. Vacuum instrumentation being supplied includes an "Alpharay" ionisation gauge for the chamber, with thermocouple gauges in the pumping lines.

FIG. 1.—*Vacuum electric-melting unit destined for the British Steel Castings Research Association.*

Chain Tab

Arthur Taylor & Company, 6, Grafton Road, Sparkbrook, Birmingham, are now manufacturing a new type of chain marking tab (see Fig. 1). These Chaintabs have been designed to comply with the Factory

FIG. 2.—*Chain tabs manufactured by Arthur Taylor & Company, of Birmingham.*

Act Order, which states that: "An identification number and the safe working-load to coincide with a certificate of test should be fitted on all lifting tackle." The tabs are available with a $2\frac{1}{2}$, $1\frac{1}{4}$ or $\frac{7}{8}$ in. dia. hole. They are easily fitted with a hammer, and have a space provided for marking with safe-working load and register identification. Once fitted, they can be annealed along with a chain without detriment, and are not liable to be destroyed in normal use. Chaintabs do not in any way interfere with the function of the tackle, and, since they are not themselves a stressed part of the tackle, weakening such as is caused by marking a link is avoided.

Rope Conveyor: Joy-Sullivan, Limited, Cappielow, Greenock, Scotland, have developed a new rope-conveyor system, which employs as a primary component the firm's original Limberoller idler*, but uses the new Limberope system. The installation comprises flexible Limberollers mounted in rigid, tubular-steel cradles, which in turn are suspended at each end between parallel wire ropes. These "stringers" are held at the required height by chains attached to stands, which carry integral return idlers. A feature of specific interest is the speed with which the entire system can be set up, dismantled and relocated to meet various point-to-point conveyor requirements.

Temperature Control: A new fully-transistorized printed-circuit amplifier-relay for use as a stable, sensitive, temperature controller, has been introduced by Honeywell Controls, Limited, Ruislip Road East, Greenford, Middlesex. With the appropriate thermistor temperature sensor, this unit, the R7079/7081 Versa-Tran, can be used for control in the range of −60 to +500 deg. F. with a differential of 1.5 or 0.3 deg. F., depending on the model. Errors due to ambient temperature conditions may be easily compensated for by means of a calibration dial. The control, which incorporates the load relay, can be used up to 300 ft. from the thermistor, and operates from the 240 v. 50 cps. supply.

Cleaning Laboratory Specimens: Ultrasonics, Limited, announce the marketing of Rapiclean 1, a piece of automatic ultrasonic apparatus which can be used to clean and degrease metallurgical specimens.

* See JOURNAL, page 238, April 26, 1956.

SECTION DEVOTED TO THE TECHNOLOGY OF PRODUCING DIMENSIONALLY-ACCURATE CASTINGS

BICTA's Second Annual Conference

Account of the General Meeting and Annual Dinner, the Year's Activities and Committee Reports (presented in London last month), of the British Investment Casters' Technical Association.

The second Annual Conference of the British Investment Casters' Technical Association held in London from May 16 to 18, under the chairmanship of Mr. D. H. Armitage (managing director, P.I. Castings (Altrincham) Limited), demonstrated in even more striking manner than its predecessor a year ago the enthusiasm and technical achievements of this small but important section of the foundry industry. The Association's membership is limited to companies employing expendable patterns and two-thirds of the eligible companies were represented by the 60 delegates attending this meeting. In addition, the conference welcomed Mr. H. J. Meerkamp van Embden (from the Philips concern at Eindhoven, Netherlands) as president of the European Investment Casters' Association and three visitors representing the Investment Castings Institute of America—Mr. K. Thompson (K. W. Thompson Tool Company, of Long Island, New York), and Mr. Claude Watts and Mr. Leo Carr (Precision Metalsmiths Inc., of Cleveland, Ohio).

ANNUAL MEETING

The Conference proper was preceded on the evening of Monday, May 16, by an informal cocktail party, and the annual business meeting on the Tuesday morning. At the annual general meeting the adoption of the annual report for the year ended March 31, 1960, was moved by the chairman who paid special tribute to the work of the committees whose efforts had done so much to gain recognition for the Association and the industry in many important commercial and technical spheres. The retiring members of the Council representing full members—Mr. G. A. Tomkinson (D. Napier & Son, Limited) and Mr. N. Walker (Hadfields, Limited)—were re-elected, and Mr. P. A. Crooke (Samuel Osborn & Company, Limited) was elected a representative of the associate members.

Following the formal business meeting the reports of the four technical committees were presented for discussion, by Mr. L. S. Taylor (G. L. Willan, Limited) on metal specification; by Mr. N. Walker (Hadfields, Limited) on technical publicity; by Mr. W. S. Fowkes (H & F Precise Castings, Limited) on industry statistics; and by Mr. W. O. Beer (D. Napier & Son, Limited) on industrial health and safety. (See following pages of this report.)

Scene at the annual dinner of the British Investment Casters' Technical Association held in the Connaught Rooms, London (the top table is shown in the background).

The president, Mr. D. H. Armitage (P.I. Castings (Altrincham), Limited) and Mrs. Armitage welcoming Mr. M. Riddihough (left) (Deloro Stellite, Limited) to the evening function.

Technical Sessions

The six papers discussed at the Conference during the five technical sessions, under the chairmanship of Mr. L. S. Taylor, Mr. N. Walker, Mr. G. A. Tomkinson, Mr. R. W. N. Danielsen (Deritend Precision Castings, Limited) and Mr. D. H. Armitage, respectively, were as follow:

"Metallurgy of 13 per cent. Chromium-steel Castings," by J. Beech, B.MET.; "Specifications for the Investment Casting Industry in the UK," by L. S. Taylor, A.C.T.(BIRM.), A.I.M., and A. G. Mason, A.C.T.(BIRM.), A.I.M.; "Investment Casting in Vacuum: Some Experiences," by L. S. Taylor, A.C.T.(BIRM.), A.I.M.; "Manufacture and Uses of Some Industrial Refractory Crucibles," by F. George, M.I.B.F., and F. W. Haywood, B.SC., PH.D., F.R.I.C., F.I.M., and "Dimensional Aspects of Lost-wax Investment Casting," by R. Taylor and N. Mason.*

Additionally, Mr. Thompson, from the USA, showed a film which he had made of the investment shell technique used in his foundry; Mr. Carr took the audience on a "tour" of Precision Metalsmiths Cleveland foundry by means of some 200 colour-slides and Mr. Watts presented a report of a study made collectively by members of the Investment Castings Institute of America to solve a hot-tearing problem encountered in a particularly difficult investment casting. Each of the technical sessions was attended by some 50 members and the remaining papers presented and a report of the lively discussions which ensued will be published in future issues of this JOURNAL.

* Printed in this issue, page 696.

ANNUAL DINNER

About 60 members, their ladies and guests attended the second annual dinner of the British Investment Casters' Technical Association held at the Connaught Rooms, London, on May 17, during the Association's annual conference. Attending the dinner also were visitors from overseas—Dr. E. J. Nickel (Germany), Mr. H. J. Meerkamp van Embden (Netherlands), and Mr. L. E. Carr, Mr. K. W. Thompson, and Mr. C. H. Watts (USA). Mr. D. H. Armitage (P.I. Castings (Altrincham), Limited) occupied the chair and accompanying him at the top table were Mr. R. W. N. Danielsen (Deritend Precision Castings, Limited), Mr. H. J. Meerkamp van Embden (Philip's Gloeilampenfabrieken), Mr. John A. Osborn, M.P., and Dr. A. H. Sully (British Steel Castings Research Association), most of whom were accompanied by their ladies. After the Loyal Toast, Mr. Osborn proposed the toast of "The British Investment Casters' Technical Association" and the response was made by Mr. D. H. Armitage. Mr. R. W. N. Danielsen (vice-chairman of the Council of the Association) proposed "The Guests" and Dr. A. H. Sully replied. Earlier in the day Mr. Danielsen had been elected to the chairmanship of the Council (to take office for the ensuing year at the conclusion of the Conference) and at this function he made reference to this, saying that it was a great honour which he appreciated very much. He then

Mr. W. Foyers (H & F Precise Castings, Limited), Mr. N. Mason (Firth-Vickers), Mrs. Danielsen, Mrs. Foyers, Mrs. George and Mr. F. George (Refractory Moulding & Castings, Limited) make a happy group at the dinner party.

(Left) Mr. Meerkamp van Embden, president of the European Investment Casters' Association, being received by Mr. Armitage, and (right) Mr. L. F. Williams (Claude Campbell & Company, Limited), Mrs. B. Auda, with Mr. E. W. Ridgeway (Colin Stewart, Limited), Mr. D. C. Jarman (de Havilland Engine Company, Limited) and Mrs. Jarman.

presented Mr. and Mrs. Armitage with a silver salver and Mr. Armitage made a short speech of thanks.

ANNUAL REPORT

Continuing the proceedings of the annual meeting, the Council took pleasure in submitting to the members its second annual report, covering the year ended March 31, 1960, and the accounts for the same period. In doing so, it recorded with satisfaction the firm establishment of the Association, and an increasing recognition and appreciation of its services and potentialities amongst members and external organizations having an interest in investment castings. The report continued as follows:—

Council

Seven meetings of the Council have been held during the year. Mr. D. H. Armitage, the founder-chairman of the Association, was re-elected as chairman for a second term, but retires from this office after the annual conference in May, 1960. The Council takes this opportunity of recording the Association's indebtedness to Mr. Armitage for his leadership during these formative years, and looks forward to his continuing service as an *ex-officio* member of the Council as provided for in the Constitution.

Mr. G. A. Tomkinson and Mr. N. Walker, representing full members, and Mr. A. Dunlop, representing associate members, retire from the Council by rotation at the forthcoming annual general meeting and, being eligible, offer themselves for re-election by their respective membership classes in accordance with the revised Constitution adopted at the first annual general meeting.

The Council records its gratitude to the chairmen and members of the Committees, and to the member companies, for placing their knowledge and experience at the disposal of the whole Association to the benefit of the industry. There is no doubt that the activities of the Technical Publicity Committee are beginning to make an important contribution to the awareness of investment castings amongst engineers.

This may equally well be said of the Metal Specification Committee, who by working through, and stimulating the deliberations of the appropriate committees of the British Standards Institution, and by accumulating technical data which may ultimately be made use of by the Technical Publicity Committee, are playing an important role in the process of developing markets.

"Domestic" Work

The Industry Statistics Committee and the Industrial Health and Safety Committee have been engaged in work of a more domestic character. In the former case they prepared a comprehensive form of questionnaire which was circulated to all, and completed by most, of the principal producers of industrial investment-castings, and which has resulted in the provision for the first time of a useful picture of the industry as a whole. While this is primarily of interest to those engaged in the industry itself, BICTA should not lose sight of its potential worth in promoting the prestige of the industry to the benefit of all. It may be thought that greater value will come from subsequent surveys of this type, not only because these may show trends in development, but because certain modifications to the questionnaire may yield more specific information; but the Committee rightly considered its primary duty was to indicate the

Mr. L. E. Carr and Mr. C. H. Watts (both of Precision Metalsmiths Inc., U.S.A.) chatting with Mr. J. Marshall, from Paris.

merit of this work and gain the confidence of the industry in the provision of data. The Council considers that in this, it has been entirely successful.

The Industrial Health and Safety Committee has had some difficulty in stimulating the interest of members. It is charged with the responsibility of identifying the hazards to health and safety in processes used and in recommending remedial measures. Its report discloses that a useful start has been made, although, because so many of the hazards experienced in investment founding are not peculiar to this single branch of industry, and because significant statistical histories are not yet available, it is either not possible or it is too early to make recommendations which are likely to be in any way novel to enlightened works management.

Committee Membership

The membership of the Committees at March 31, 1960, is shown below:

Metal Specification Committee: Chairman: Mr. L. S. Taylor (G. L. Willan, Limited); Mr. I. L. Gwynn (P. I. Castings (Altrincham), Limited); Mr. W. Hinchliffe (Samuel Osborn & Company, Limited); Miss A. E. Lane (D. Napier & Son, Limited); Mr. A. G. Mason (Deritend Precision Castings, Limited); Mr. B. W. Prince (Firth-Vickers Stainless Steels, Limited), and Mr. G. F. Smith (Hadfields, Limited).

Technical Publicity Committee: Chairman: Mr. N. Walker (Hadfields, Limited); Mr. J. J. Cadwallader (H & F Precise Castings, Limited); Mr. A. F. Eyres (Birmingham Small Arms Company, Limited); Mr. J. Hendry (Preformations, Limited); Mr. D. E. Hope (Monsanto Chemicals, Limited); Mr. W. N. Jones (Deritend Precision Castings, Limited), and Mr. N. Mason (Firth-Vickers Stainless Steels, Limited).

Industry Statistics Committee: Chairman: Mr. W. S. Fowkes (H & F Precise Castings, Limited); Mr. E. J. Crawley (Chambers Bros., Limited); Mr. L. L. Greig (Deritend Precision Castings, Limited), and Mr. G. L. Willan (G. L. Willan, Limited).

Industrial Health & Safety Committee: Chairman: Mr. R. Taylor (Firth-Vickers Stainless Steels, Limited); Mr. W. O. Beer (D. Napier & Son, Limited), and Mr. F. Evans (P. I. Castings (Altrincham), Limited).

The Council also records its thanks to the following, who served on the Committees during the year:—Mr. W. J. Humphreys (formerly of Deritend Precision Castings, Limited), and Mr. C. Lewis (formerly of Hadfields, Limited), who both served on the Industry Statistics Committee; Mr. G. A. Tomkinson and Mr. W. O. Beer (D. Napier & Son, Limited), who preceded Miss A. E. Lane on the Metal Specification Committee.

Association Membership

It is with regret that the Council reports that no new applications for membership have been received from investment founders. It is quite clear that the whole of the industry stands to benefit from the range of activities in which the Association is engaged, and that none of the participating companies has anything to fear from co-operative work in these fields. With the wide variations in productivity and techniques, as revealed in the Industry Statistics Survey, it is thought that even the non-member companies engaged solely in meeting their own internal needs for investment-cast components would find much of interest and direct application in BICTA's endeavours. The Council therefore urges such companies to reconsider their attitude to membership in the light of the Association's record of achievements to date and intentions for the future.

The continuing support of associate members is especially gratifying to the Council, and it is pleasing to report that four additions to this class of membership have been made during the year, namely:—A.P.V.-Paramount, Limited; Joseph Lucas, Limited; Morgan Refractories, Limited, and Spartan Steel & Alloys, Limited.

Finance

The income and expenditure account for the year under review again shows a small surplus, but this is in large measure due to the specially favourable terms on which the Association has been provided with accommodation and secretarial services by the British Steel Castings Research Association, and to the fact that much of the work of the Metal Specification and Technical Publicity Committees has so far been of a preparatory nature calling for only a small expenditure.

However, the British Steel Castings Research Association has now requested that, as from April 1, a revision should be made in the fee payable to them, and the Council has also had to recognize that an increase in printing and other charges must bé met to bring some of the work of the Committees to fruition.

It has therefore been decided to recommend to the next annual general meeting that the rates of annual subscription be increased from 40 to £100 in the case of full members, and from 25 to £40 in the case of associate members. These new rates, on the basis of the present membership, will yield a total income of £1,460, which in terms of the turnover of the industry and the benefits to be secured by the work in hand, will, the Council believes, be regarded as extremely modest.

Conferences and Meetings

In addition to the seven meetings of the Council, and fifteen meetings of the technical committees held during the year, the first annual conference was held in London on May 10 and 11, 1959, and was attended by about 70 representatives of members, other investment foundries and user interests. The programme comprised the annual general meeting, the presentation and discussion of six technical papers, and the annual dinner attended by some 85 members and ladies and presided over by the chairman, Mr. D. H. Armitage. Mr. W. L. Beesly, Director of Engine Production, Ministry of Supply, was the principal guest.

The Association also participated officially in the Sixth European Investment Casters' Conference, at Essen, June 1 to 3, 1959, a report of which prepared by the secretary was circulated to all members. It is now represented by the secretary on the organizing committee responsible for future international meetings.

The Association accepted an invitation to participate in the BSCRA Conference on the High-frequency Electric-melting Furnace in Steel Foundries, on April 30, 1959, and was represented thereat by a number of members.

At the instigation of the Industrial Health & Safety Committee, the British Steel Castings Research Association organized for members a training course on the sampling and assessment of atmospheric dust, on December 3 and 4, 1959. Five members took advantage of this arrangement.

Publications

Through the co-operation of the FOUNDRY TRADE JOURNAL, who provided run-on copies of their pages containing the papers presented to the first annual conference, it has been possible at very little cost to provide all members with an attractively bound volume of the proceedings of that conference.

In connection with the stand which the Association took at the Minibition of the Purchasing Officers' Association at Folkestone from September 24 to 26, 1959, a leaflet entitled "Investment Castings in Metal" was prepared. Over 300 copies have been distributed outside the membership.

The Technical Publicity Committee has been responsible for the production of two lecture scripts for the use of members addressing meetings of local engineering societies, and teachers in technical colleges. These lectures describe both the essential features of the investment-casting process, and some applications of investment castings. One of them was presented by members of the Committee to four meetings of the Institution of Production Engineers during the 1959-60 session.

A bibliography (No. 2 in the BICTA series) has been assembled to provide the increasing number of enquirers with references to some of the principal publications on the investment-casting process.

(Left) Mr. G. A. Tomkinson (D. Napier & Son, Limited), Mrs. Tomkinson, Mr. W. O. Beer and Mr. C. W. Andrews (both of Napier's) with Mrs. Andrews and Mrs. Beer make a composite informal group at the dinner with (right) Mrs. Dunlop, Mrs. Sully, Mr. Danielsen, Dr. A. H. Sully (British Steel Castings Research Association) and Mr. A. Dunlop.

BICTA's Second Conference

External Relations

In addition to the formal link now established between the Association and the European Investment Casters' Conference, to which reference has already been made, friendly relations have continued with the Investment Castings Institute of America, and have been made with the Investment Casters' Committee of the *Verein Deutche Geissereifachleute*, who are engaged in the formulation of national specifications for investment-cast alloys. Members will have been gratified to learn that the Association's contact with the American Institute has led to the submission of valuable contributions to the second annual conference, and the receipt of cordial invitations for BICTA members to participate in ICI meetings at Virginia Beach (held on April 21 to 23, 1960), and at Chicago, from October 25 to 27, 1960.

BICTA's relations with the British Standards Institution are described fully in the report of the Metal Specification Committee, but the Council is pleased to be able to emphasize here the fact that the Association is now referred to by the Institution on all matters relating to its products. Indeed, the Association has already established itself as a focal point for enquiries about the industry and its products, and is being consulted on a wide range of topics by an increasing number of enquirers. Particular mention may be made of the Ministry of Aviation, many technical colleges and schools, and some potential customers. The last mentioned are provided with a list of all full members.

Library Service

Ten members regularly use the library service provided by arrangement with the BSCRA, through which *Investment Castings Abstracts* are published in alternate months. This service provides the participating members with a coverage of the world literature, more than 120 references having been included in the last year.

Conclusion

The excellent start to BICTA affairs which the Council was able to report last year has been further strengthened and consolidated, and the Council believes that, given the continuing support of the membership, the Association can look forward with confidence to further recruitment of membership and the full development of the programme of activities for which the foundations have been laid.

The Council places on record its indebtedness to the British Steel Castings Research Association for the help which has been given directly and indirectly in many directions, and acknowledges also the services of Mr. Bolton, the secretary, who has contributed so much time and thought to the Association's affairs.

(The Report is signed on behalf of the Council by Mr. D. H. Armitage, the chairman.)

Membership of the Association

(As at March 31, 1960)

Honorary Member

Dr. J. D. Jevons (Joseph Lucas, Limited).

Full Members

Birmingham Small Arms Company, Limited; Deloro Stellite, Limited; Deritend Precision Castings, Limited; Firth-Vickers Stainless Steels, Limited; Hadfields, Limited; H & F Precise Castings (1959), Limited; D. Napier & Son, Limited; P. I. Castings (Altrincham), Limited, and Preformations, Limited.

Associate Members

A.P.V.-Paramount, Limited; Astor Boisellier & Lawrence, Limited; Chambers Bros., Limited; Claud Campbell & Company, Limited; W. J. Hooker, Limited; Mond Nickel Company, Limited; Monsanto Chemicals, Limited; Samuel Osborn & Company, Limited; Refractory Mouldings & Castings, Limited; Colin Stewart, Limited; Wilkins, Campbell & Company, Limited, and G. L. Willan, Limited.

COMMITTEE REPORTS

At this stage in the proceedings, a number of reports were presented of Committee work undertaken within the Association. The reports were presented by the respective chairmen and covered metal specifications, industrial health and safety, technical publicity and statistics. The first three of these are reported in what follows:—

Metal Specifications

At the four meetings of this Committee held during the year, important progress has been made with the several projects with which the Committee is concerned. These are: (1) co-operation with the British Standards Institution in regard to specifications for investment-casting alloys, and components which include investment castings; (2) the accumulation of data on the mechanical properties exhibited by investment-cast alloys produced under normal production conditions; (3) proposals for an international programme of investigation of the impact properties of investment-cast alloys, and (4) research into the variable impact properties and surface defects associated with 13 per cent. chromium cast steel.

British Standards

The Association, through the Committee, has direct representation on three committees of the British Standards Institution which are concerned with the production of standards of interest to the industry. The first of these—ISE/60 Investment Castings on Metal—has been responsible for the production of BS 3146 Part 1, which was published in September, 1959, and covers 12 grades of carbon and low-alloy steel. Subsequent parts of this specification will include nickel-, cobalt- and ferrous-base alloys for heat-, corrosion- and wear-resisting applications, and representations will be made to BSI for the inclusion

of an additional part dealing with copper- and aluminium-base alloys. There is no doubt that the existence of BICTA, and the opportunities for investment founders to discuss these matters privately among themselves in the Metal Specification Committee, have done much towards strengthening the industry's position in relation to the production of the standards.

Other BSI Committees on which the Association has official representation are those dealing with surgical implants and with surgical appliances. In these spheres there would appear to be a large field for further investigation of the design and metallurgical factors involved, and the Committee, having due regard to the high acceptance standards necessarily imposed on components for these applications, is seeking to clarify a number of issues which have been raised.

Mechanical Properties of Investment Castings

The Committee takes this opportunity of expressing its thanks to all member companies who have co-operated in the compilation of data on the mechanical properties of investment castings. These data are summarized and commented upon in a paper which two members of the Committee (Mr. A. G. Mason and Mr. L. S. Taylor) are presenting to the Association's second Annual Conference. They will undoubtedly prove of value in further negotiations regarding specifications; and will be available to the Technical Publicity Committee for use in their programme of acquainting engineers with the properties of investment castings.

Impact Testing

At the 1959 European Investment Casters' Conference, proposals were made by Monsieur Mathy of Belgium to the effect that all participating countries should collaborate in an investigational programme aimed at determining factors of composition and thermal treatment affecting the impact values of alloys suitable for investment casting. Subsequent to the Conference, M. Mathy made specific proposals for a programme to be undertaken by investment founders in the United Kingdom, and these were considered in detail by the Committee. In view of the existing commitments with respect to the two preceding projects (British Standards and Mechanical Properties), it was considered by the Committee that no reasonable progress could be made with this new programme before the next European conference, when it is hoped to have further discussions with M. Mathy on the technical content of his proposals.

Thirteen per cent. Chromium Steel

In August, 1959, the Ministry of Supply (now Ministry of Aviation) advised the Association of their intention to issue a DTD Specification for corrosion-resisting steel of 45 tons per sq. in. tensile strength, and asked for the Association's opinion on the suitability of 13 per cent. chromium steel for this purpose. Having regard to the variable impact properties and the surface defects encountered in the production of castings in this alloy, the Committee advised the Ministry that, in their opinion, the issue of a DTD Specification would be ill advised for the time being. It was, however, indicated to the Ministry that the industry would be prepared to initiate a programme of investigation of these sources of difficulty, and the hope was expressed that such an investigation would be supported financially by the Ministry. Discussion with the Ministry showed, however, that financial support would not be available at least for the present; but almost simultaneously it was learned that the British Steel Castings Research Association are undertaking a research programme in this field, and would be prepared to include aspects of special significance to investment founders. Particulars of the latter have, therefore, been provided by the Committee, and it is confidently expected that arrangements between the two Associations will shortly be concluded to enable this research to proceed.

(Signed by Mr. L. S. Taylor, the chairman.)

Industrial Health and Safety

The terms of reference of this Committee are to identify and assess the hazards to health and safety peculiar to investment founding, and to make arrangements for the industry to be advised on measures that may be taken to avoid or reduce such hazards. To this end the Committee has met three times, and has had the benefit of contacts with HM Inspectorate of Factories in general, and with the British Steel Castings Research Association on the particular matters of airborne dust and noise measurement.

The Committee has identified the following as the main hazards encountered in investment foundries:

(*a*) Explosion hazard resulting from use of alcohol-base solvents.
(*b*) Respiratory diseases consequent upon airborne siliceous dusts.
(*c*) Slipping on wax-room floors.
(*d*) Noxious fumes.
(*e*) Eye injuries from particles in fettling-shops, and radiation in melting shops.
(*f*) Burns from wax and metal splash.
(*g*) Burns from caustic soda and acids.
(*h*) Dermatitis.
(*i*) Noise.
(*j*) Radiation hazards.

It can hardly be said that any of these hazards are peculiar to investment foundries, but to the extent that some are more serious and more frequently occurring than others, and remedial action less obvious or less well known, the Committee considers that it can make some contribution towards improvements in the industry.

Explosion Hazard

Danger of explosion arises principally if insufficient forced-draught ventilation is provided in ovens used for the drying of investment moulds incorporating alcohol suspending agents, and in fact was the cause of some serious accidents in the

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industry some years ago. Recommendations for avoiding this hazard are contained in the Ministry of Labour's Form 1856, obtainable from HM Stationery Office. The Committee understands that this is being revised so that the information is presented in a more easily understood way.

Respiratory Diseases

Wherever siliceous dust of less than five microns in size is airborne in sufficient concentrations, there is a risk of silicosis. It has been thought that these conditions may be encountered in some departments of investment foundries. So far as the Committee is aware, no data are available to indicate the seriousness of this hazard. Considerable knowledge is available in other industries on means for assessing airborne dust and in interpreting the data so obtained, and the Committee arranged with the British Steel Castings Research Association for representatives of BICTA members to be given a short course of instruction on December 3 and 4, 1959, on the techniques involved. Unfortunately only five members were able to avail themselves of this opportunity and, so far as is known, little further action is being taken to undertake the surveys that are necessary to the provision of these data. Until this preliminary work has been done and results reported over a period of time, the Committee is not in a position to make further comment, beyond saying that there are indications that the dust levels in some investment foundries appear to be significantly lower than the general level in steelfoundry fettling-shops, although the proportion of respirable quartz may be higher. In the meantime attention is drawn to the value of arranging for employees to be subjected to regular X-ray examination of the chest.

Slipping on Wax-room Floors

With regard to the danger of slipping on wax-room floors, the Committee has consulted the Building Research Station of the Department of Scientific and Industrial Research, and the Industrial Health and Safety Centre of the Ministry of Labour and National Service. The former has drawn attention to the possibility of using non-slip finishes of relatively low durability, which can be readily renewed. The Industrial Health and Safety Centre recommend the use of grid floors of certain selected types where the flats are less than $\frac{1}{4}$ in. wide; if wider than this, they quickly become coated with wax and as slippery as a solid floor. However, the Committee is of the opinion that the use of gratings is impracticable where female labour is employed, because of their footwear, and it recommends that the only adequate remedy for this hazard is continuous and thorough cleaning of the floor, which must be maintained in good condition. Such cleaning is best carried out by applying a detergent to the floor, using a mechanical scrubber to loosen the wax, and following this by a suction cleaner to remove the loose particles.

Noxious Fumes

Two publications which are generally available give acceptable limits of concentration of fumes such as carbon tetrachloride and trichlorethylene, namely "Toxic Concentrations of Various Gases, Dusts, Fumes and Metals in the Atmosphere" (Imperial Chemical Industries, Limited), and "Threshold Limit Values of 1959 adopted at the 21st American Conference of Governmental Industrial Hygienists, Chicago, April 25 to 28, 1959" (A.M.A. Archives, 1959, 20 (3), September, 266-270). These, coupled with DSIR leaflets published by HM Stationery Office under the title "Methods for the Detection of Toxic Gases in Industry" (No. 12 deals with organic halogen compounds), are likely to provide all the data necessary for maintaining appropriate standards in investment foundries. The Committee considers it to be impossible to make any general recommendations under this heading.

Eye Injuries, Burns and Dermatitis

Such hazards as eye injuries, burns and dermatitis are too well known in industry to warrant special comment, but it should be noted that the Factory Inspectorate generally recommend that eye protection from flying particles should be secured where possible by shields fitted to machines, rather than by the wearing of goggles or eye-shields, since the latter are often disliked by operatives, or may be forgotten. An excellent leaflet entitled "Your Eyes are Precious" has been published by the British Steel Founders' Association. Attention is drawn to a new buffer solution marketed by Imperial Chemical Industries, Limited, Northwich, which is said to be preferable to weak acid for first-aid treatment of caustic soda burns, since it may be self-administered.

The Factory Inspectorate has had for some years a Committee investigating foundry goggles, and two reports have been published. It can be expected that the findings of this Committee will be incorporated in the products offered by the numerous manufacturers of these appliances. Where gloves are necessary or preferable to barrier creams for protection against dermatitis, a p.v.c. glove with soft cotton lining has been found to give excellent protection against acid under both wet and dry conditions.

Noise

Once again the Committee has been able to call upon the resources of the British Steel Castings Research Association to arrange a survey to determine noise levels occurring under investment-foundry conditions. This survey was made in a single member foundry which can be regarded as being typical, or above average so far as noise levels are concerned, and it showed that in only two areas—the vicinity of the melting furnaces and the knock-out booths—are noise levels so high that prolonged exposure to it may impair hearing. The generally accepted threshold value is 85 decibels, and the maximum value recorded in this survey was 100-102 decibels at the knock-out booths. It is interesting to note that operatives engaged in noisy areas at this foundry wear ear-muffs (manufactured by Mallock-Armstrong, Limited, Guildford).

An alternative solution which may be applicable in many cases, particularly in knock-out and fettling areas, is to employ baffles of acoustic tiling or sound-absorbent materials, but the extent to which these can be applied in any particular foundry would depend on local circumstances. Members will be aware of the increasing attention which is being given to noise problems, and it may well be that further investigations are warranted.

Ionizing Radiations

This hazard has been included by the Committee because a majority of investment foundries have X-ray or gamma-ray radiographic departments. Attention is drawn to the Factories (Ionizing Radiations) Special Regulations, a second draft of which has recently been issued by the Ministry of Labour and National Service for comment. It is expected that they will become obligatory later this year.

Conclusion

The Committee will welcome comments from members on its interpretation of its terms of reference, and their collaboration in the further assessment of the seriousness of the hazards to which reference has been made. Clearly, in many directions little further can be done by the Committee without the active assistance of members in placing facilities at the disposal of the Committee for practical work to be done.

(Signed by Mr. R. Taylor, the chairman.)

Technical Publicity

The Committee has been engaged on a variety of activities, with the aim of widening the interest in investment casting, within the engineering industry. The main activities can be summarized as follow:

Editorial Publicity

A total of 12 Press releases have been made available to technical journals, and it is considered that in achieving the acceptance of eight of these, a favourable view can be taken of this campaign. Further Press releases will be made from time to time as suitable material is available.

Exhibitions

Utilizing castings provided by members for lecture purposes, a presentable display of the industry's capabilities was made at the Purchasing Officers' Minibition at Folkestone, in September last. A special leaflet was prepared for the occasion, and some 300 copies of this were circulated. A constant review of exhibitions is held at the Committee's meetings, to consider participation where suitable.

Lectures to Technical Societies

BICTA's offer to lecture to technical societies was accepted by four such societies during the Winter session 1959/60. Four societies have already accepted the offer to provide lecturers for next winter's lecture programmes.

Teaching Aids to Technical Societies

Enquiries have been received from technical college lecturers for material on investment casting. Lecture scripts, bibliographies, etc., have been provided and lantern slides loaned in response to these requests. It is hoped that this work can be extended in the future, and might embrace the provision of wall charts illustrating diagrammatically the stages of the investment-casting process.

Publicity Leaflets

The preparation of a series of leaflets illustrating the advantages of investment casting is at present under review. In the event of proceeding with this plan, it is hoped that member companies would support the scheme by purchasing the leaflets at cost for distribution to potential users of investment-cast products.

(Signed by Mr. N. Walker, the chairman.)

(The BICTA Committee Report on Statistics will be printed shortly)

Steel Desulphurization with Mg*

Rapid desulphurization of steel in the furnace, coupled with excellent hot ductility of the treated metal, has been obtained with additions of magnesium, according to W. B. Brooks, A. C. Doumas, and B. W. Romefelt, all connected with the Dow Chemical Company, USA.

A degree of success in the past, they recall, has been obtained with calcium, cerium, certain slag practices, and lengthy furnace treatment. Although, based on thermodynamics alone, calcium should be very effective as a desulphurizer, its extremely low solubility in liquid steel limits its effectiveness. Magnesium, on the other hand, has faster solubility and acts more directly on sulphur.

Research has shown that magnesium powder diluted with lime can be successfully injected into molten steel. While most of the work at the Dow Chemical Company has been restricted to 500-lb. basic electric furnaces, trial heats have also been run in 5-ton and 20-ton furnaces, the magnesium additions more easily being carried out with larger heats. From 2.5 to 5 lb. of magnesium per ton of steel was found to give rapid sulphur reduction, no elaborate slag practice being necessary. So far, over 100 500-lb. heats have been treated, results indicating that between 50 and 80 per cent. of the sulphur in the bath can be removed. In general, starting with a fairly low sulphur content of from 0.020 to 0.030 per cent., consistent reductions to levels below 0.003 per cent. S can be obtained.

Magnesium-treated steels of suitable composition have an exceptionally high ductility at elevated temperatures. Thus an SAE No. 1020 steel containing, C 0.18-0.23; Mn, 0.30-0.60; maximum P 0.040 and S 0.050 under tensile test at about 1,250 deg. C., fractured with practically no reduction of area, while after treatment with magnesium a similar specimen gave almost 100 per cent. reduction in area without fracture. As-cast Charpy impact data revealed that treated steels had double the impact values of untreated.

* Extracted from *Iron Age*.

Dimensional Aspects of Lost-wax Investment Casting*

By R. Taylor and N. Mason

The authors have dealt mainly with the why's and wherefore's of the fact that, whereas the lost-wax investment-casting process is often claimed to be accurate to ±0.005 in., this tolerance is sometimes not achieved. This paper is also a useful corollary to one similar recently published† in the JOURNAL, dealing with investment-casting at the Renault organization in France.

The objects of this paper may be summarized as follow:—

Part 1: To discuss in a simple fashion, the dimensional aspects of lost-wax investment casting chiefly to be of benefit to buyers, methods engineers, process engineers, designers, inspectors, etc., who are entitled to know why the process, which is often claimed to be accurate to ±0.005 in. per in., regularly fails to achieve this tolerance. Additionally, certain data is presented which may be of interest to other investment founders, at the same time, initiating general discussion of the subject of dimensional reproducibility regularly achieved by the various forms of lost-wax, and perhaps the other so-called precision processes.

Part 2: To discuss briefly the several factors which result in the "scatter" of "as-cast" dimensions in lost-wax castings.

Part 3: To present diagrams of actual production-check data illustrating the general level of reproducibility of "as-cast" dimensions achieved by the conventional lost-wax process.

Part 4: To outline the collation of production-check data which were intended to form the basis of a more accurate and reliable formula for predicting master-pattern and die-contraction allowances.

Part 5: To discuss the value of the "precision," or reproducibility which can be achieved "as-cast" in terms of practical economics and engineering.

GENERAL POSITION

Practically every component undertaken for manufacture as a legitimate lost-wax casting forms both a challenge and a compromise. The challenge consists in the endeavour to meet certain tolerance ranges "as-cast," and by this means obviating machining, either expensive or otherwise. The compromise can take one or more forms, for example:

(1) Certain dimensions or areas intentionally cast with excess material, to allow a finishing operation to bring the component inside limits narrower than those economically achieved "as-cast."

(2) Holes left solid, where a high level of accuracy and location of the centres is called for, and where a finishing operation such as reaming would be difficult.

(3) Modifications of casting design, to either facilitate its manufacture as a casting, or ease subsequent machining operations.

Obviously, the range of tolerance laid down by the customer's drawing, and to which the investment founder endeavours to work, should never be tighter than is necessary for the correct functioning of the component. Unfortunately, however, a high percentage of component drawings submitted to the investment founder are what might be called "toolroom" drawings, where many, if not all, dimensions are shown to two or three decimal places and to tolerances of the order of ±0.003 in. or ±0.001 in. Whilst these are normal and strictly applicable for production by conventional machining operations, turning, milling, etc., in many instances some of these tolerances are not functionally necessary, and the wider tolerances achieved by lost-wax casting can, by agreement, be acceptable for the part in service.

Paradoxically, what is probably the investment founder's greatest problem is never encountered in the foundry itself. This is the difficulty of endeavouring to "sell" precision castings, and, on being pressed for a definition, quoting "generally ±0.005 in. per inch." When getting down to case details, it becomes necessary to modify this claim on so many counts—*e.g.*, a fillet here, 0.030 in. grinding allowance there, some narrow, deep recess cast solid—that it is not altogether surprising that buyers, engineers and designers, unfamiliar with the overall intrinsic value of the process, come to the conclusion that it will be cheaper to machine the component from the solid.

No Threat to Machining Techniques

The basis of the value of the process is its ability to save on production costs, in both time and money, and particularly to achieve results which, either due to shape or material, are impractical by conventional machine-shop methods. There is no justification for the premise that it is a threat to the very existence of machining and

*Paper presented at the second annual conference of the British Investment Casters' Technical Association, held at Connaught Rooms, London, from May 16 to 18. Of the authors, Mr. Mason is associated with Firth-Vickers Stainless Steels Limited, as was Mr. Taylor at the time of preparation of the paper. Mr. Taylor has, however, now left that company's employment.

†"Investment Casting at Renault," May 5 issue of the JOURNAL.

allied techniques. The inability to appreciate this point often leads to difficulties in establishing realistic inspection standards, based on the criterion "will the casting make to the final drawing?"

Considerable work has and is continuing to be done to alleviate this misunderstanding. Such organizations as the British Investment Casters' Technical Association, the American Investment Casting Institute, and the European Investment Casters' Association are helping towards this end. Reward for these efforts must surely take the form of an intelligent, unbiased approach to the problems of the investment founder by the engineer designer, who will assist by accepting a compromise as well as offering a challenge. The progress that has been made is encouraging, inasmuch as it is now not unknown for an investment founder to receive a component drawing marked up with all the desirable machining allowances, casting tolerances, etc., and actually called a casting drawing.

Ideally, every user of bought-out investment castings should have at least one member of its staff fully acquainted with all the pros and cons of the subject. Practically, this is impossible, and it is, therefore, up to the investment founder to provide the expert opinion and guidance. This task will obviously be much easier if the purchasing organization has a clear idea of the reasons for technical co-operation between the two parties. One of the main points is to clarify what the process is capable of achieving dimensionally, and to establish the relationship of this to the cost of the casting as supplied.

CAUSES OF DIMENSIONAL VARIATION

A production batch of castings is essentially the result of a similar run of moulds and wax patterns. The wax patterns themselves are made from a stable dimensional cavity. The small range in temperature involved in wax-pattern production can have very little effect upon the dimensional stability of the die cavity, and it would appear safe, on that basis, to assume that this can be regarded as the stable origin of the subsequent casting dimensions.

"Scatter" of Readings

When a completed batch of castings is measured on any dimension, even to the nearest thousandth of an inch, the results, on being plotted, invariably show a "scatter," or range of readings. This implies that a series of factors have influenced production in such a way as to alter the dimensions. These factors have effected the change since the original control of the die cavity initiated the production. The graph form, by plotting the above figures, indicates, in practically every case, a hump with the frequency of any individual reading tapering off more or less symmetrically from the mean reading of maximum frequency. The greater the number of readings plotted, the more definite is this form of spread or scatter shown. The conclusion to be drawn from this is that the series of process variables which alter the dimensions of castings *operate at random*. It is an even chance that any influence "B" following influence "A" will act in the same direction, *i.e.*, it will either increase the deviation from the average or act in the opposite direction and neutralise it. The magnitude of these minute influences will also vary about a mean, so that again, in some instances, influence "B" can either be less or more than influence "A".

Process Variables

Further attention should now be paid to the series of process variables, which are responsible for two things: (1) An average casting dimension which differs from the die-cavity dimension, and is generally 2 per cent. smaller, and (2) A fairly well defined form of scatter about the mean dimension. The reasons for (1) are briefly summarized as:

(*a*) Wax contraction below the die-cavity dimension.
(*b*) Mould-cavity expansion due to the expansion of the wax, on heating prior to melting out.
(*c*) Mould shrinkage on drying out its liquid binder, and the shrinkage of the gel films binding the refractory particles.
(*d*) Mould expansion due to the high-temperature firing (approximately 1,000 deg. C.).
(*e*) Shrinkage of the casting, from the molten state to room temperature.

As indicated, the net effect is a shrinkage which is due mainly to (*a*) and (*e*) swamping the effects of (*b*) and (*d*). (*c*) is a small effect relative to (*a*) and (*e*). Obviously, the above factors (*a*) and (*e*) contribute to the total scatter in much the same proportions as the magnitude of their influence on the deviation of the mean casting size from the die-cavity dimension. This in turn means that wax-pattern size and casting contraction variables account for the bulk of the scatter observed. Accordingly these two major factors will be discussed in a little more detail.

Wax Pattern Contraction

The number of factors affecting the dimensions of the wax pattern are numerous. Amongst them are:

Wax composition: The injection wax used is generally a blend of wax, plus natural or synthetic resins. Being organic materials, and to a large extent of natural origin, quite wide variations, for example, in molecular weight, can occur, with a resultant change in rheotropic behaviour, shrinkage characteristics, etc. For a given wax blend as purchased, this factor should be reasonably constant. Since few, if any, investment foundries employ their own qualified wax technologist, they must depend on their wax suppliers to exercise rigorous control over the uniformity of his product. Unless the investment founder has confidence in the ability of his wax suppliers, the wax may be blamed for troubles for which it is not responsible.

Wax Temperature, and Pressure: The temperature, or physical state of the wax, during injection, and the pressure maintained, and time of maintaining it after the die cavity is filled, must be con-

Lost-wax Investment Casting

sidered together. There are two extremes: (*a*) when the die cavity is filled by pouring in extremely hot wax, ceasing the instant the die is filled, and (*b*) where the die cavity is filled by high-pressure injection, using wax at the lowest possible temperature, and pressure feeding until all the wax in the pattern cavity has reached the solid state. In the former case, the minimum amount of wax enters the die, and, on cooling to the solid state, shrinkage of the pattern and variation of shape from pattern to pattern will be at a maximum. In the latter case the maximum amount of wax enters the die, and shrinkage is virtually nil, with a corresponding minimum in variation of dimensions, pattern to pattern (ignoring any distortion caused whilst stripping the wax from the die). Normal production conditions fall somewhere between these two extremes, and conditions cannot be controlled to the degree necessary to eliminate all variations due to these factors.

Shape and Size of Die: The geometry of the die, and the size, shape and feeding system of the various cavities, can all exert some influence on the resultant average and range of dimensional variation.

Deformation after Stripping: Creep also occurs after extraction of the wax from the die. Wax is a poor conductor of heat, and consequently the chill exerted on the surface of the pattern, caused by the die-cavity wall, does not reach the centre of any but the thinnest sections of the pattern by the time the wax is considered rigid enough to strip from the die. If the wax was left in the die long enough to cool throughout its mass, it would mean that in many cases the pattern would be broken in attempting to strip it from the die. This would result from contraction of the mass across some part of the die, causing a strong "gripping" effect. In practice, therefore, wax patterns are usually stripped from the die with some temperature gradient still existing in the mass of the wax. The effect of this gradient is to result in "frozen in" stresses, and resultant creep, or deformation, with further variable shrinkages, after stripping the wax from the die. For especially critical components, where the shape is suitable, for example turbine blades, the dimensions of the wax patterns can be made more consistent by clamping the patterns in a series of suitably constructed "holding" dies, till the next production stage.

Mounting and Storage: Subsequent wax mounting operations, and storage, even under the carefully controlled conditions of temperature and humidity usually employed, can have some effect. The local heat employed when welding to the runner, or feeding system will mean that the "skin," at least, will have been subjected to a change in temperature locally.

From the foregoing, it will be seen that the problem of holding wax dimensions is a complicated one.

Shrinkage and Distortion on Cooling

When casting, molten metal usually at a temperature well above its freezing range is poured into a mould at a relatively high temperature (*i.e.*, relative to the "cold" mould of conventional foundry practice). The reason for this is that, with the mass of molten metal poured being generally small, *i.e.*, an average of only a few lb., this mass will freeze very rapidly. Since the general configuration of the lost-wax casting has such a high ratio of area to volume, whether it is one single casting, or a cluster of several hundred smaller castings, it is essential that the metal should be allowed to fill the cavity before freezing, hence the reduction of chilling effect by the use of a hot mould. Additionally, of course, heating the mould ensures that the wax carbon residue, and remaining liquid bond residues are removed, obviating the risk of explosion or gas evolution when pouring.

Counter to the advantages accruing from a hot mould, complications can arise in certain cases from the delayed freezing of certain parts of the cast mass. This causes local shrinkage, distortion,

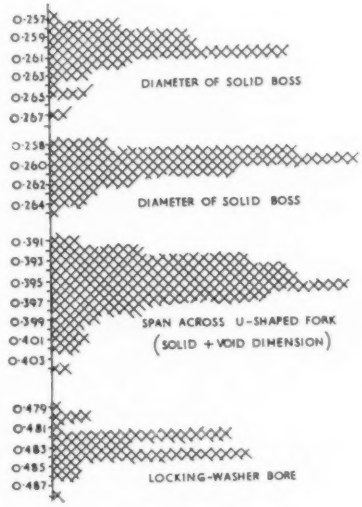

FIG. 1.—*Diagrams showing the results of a small selection of dimensional-check surveys on investment castings. Each cross in these histograms indicates an "as cast" micrometer reading.*

hot-tearing, and possibly surfaces which are "open" or "spongy." To avoid this, in certain cases, cooling of the mould below the firing temperature can be resorted to. This increases the chilling effect, and improves certain surface areas by promoting a greater degree of directional solidification, etc. A danger here is that the mould-cavity coating or primary investment may spall or buckle, causing scrap castings. Additionally, the feeding of various parts of the mass can be upset due to premature freezing of certain sections.

Obviously some compromise is necessary, since it is impossible to avoid some temperature gradient in the mould, and the heat content of each "pour" cannot be controlled to extremely fine limits. The volume of liquid metal contained by the mould cavity will shrink to a certain degree on reaching the solid state. This degree is affected by: (1) the amount of superheat above the liquidus temperature; (2) the extent to which volume shrinkage can be reduced by adequate feeding from an adjacent supply of molten metal, and (3) the rigidity or, conversely, the collapsibility of the skin of the casting—this being a function of its section according to the amount of chilling, shape, permeability of the mould, etc. Various investigations have revealed a number of other subsidiary factors (for example, the effect of varying the metallostatic head), all of which add their contribution to the total variance.

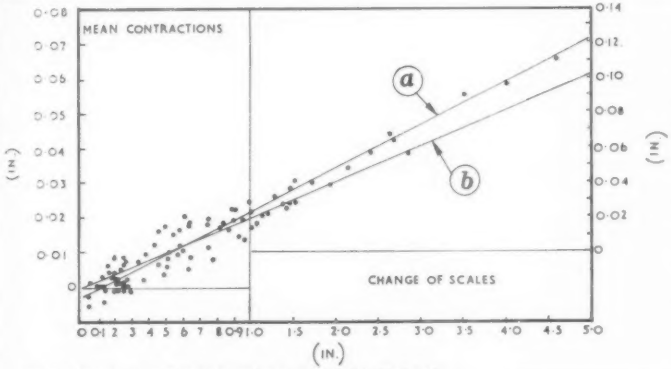

FIG. 2.—*Graph of results obtained from a fair number of dimensional checks on castings, the plotted points representing the mean contraction in terms of thousandths of an in. for "as-cast" dimensions up to 4½ in. Each point represents the mean contraction of one sample. Line (a) is the "line of best fit," from the formula* $0.1 + \frac{102.5}{100}(C - 0.1)$, *where C is the required mean casting dimension; line (b) is the "standard" contraction allowance* (0.020 *in. per in.*).

TYPICAL PRODUCTION VARIATIONS

In the early days of the investment-foundry industry, the normal practice was to put through samples for dimensional check and thus arrive at a percentage contraction figure for future use. As a result, various figures have been utilized as standard in the absence of any evidence to the contrary. Various investment foundries have had their own standards, one foundry working to 0.020 in. per in. contraction, another one to 0.015 in. per in., and so on. It is, perhaps, not surprising that samples are produced with average dimensions differing from the sizes predicted by the "standard" contraction allowance. Emphasis must naturally be placed on the word *average* contraction, this point being most important. As discussed earlier, there is an inevitable range of scatter, and it is obviously unwise to measure only a very few castings taken at random, and to utilize these few dimensions as a basis for the decision to clear the job for a production run. The probability is that the castings marked out were at the "tail end" of the size distribution scatter on some dimensions. In such cases, the result could be that, after dimensional-check-samples have been approved by the customer, bulk supplies may be produced with certain "as cast" dimensions varying (possibly *on the bulk* of the production run) outside the drawing tolerances to which the sample was checked. It is essential for the founder to make and dimensionally check a sufficient number of samples to establish reasonably accurately the mean or average dimensions typical of production of each component. These results enable adjustment of the die dimension to be made where necessary, in order to give the maximum acceptable yield "as cast," to minimize the percentage of castings outside the acceptance range, and to minimize the amount of finishing work, where fettling to gauge limits is involved.

Type of Result obtained

Fig. 1 shows in diagrammatic form the results of a small selection of dimensional-check surveys, and the type of histogram obtained. These are only four cases out of a large number which have been accumulated. They give a hint of the considerable amount of valuable information which a detailed analysis provides. One useful result is worth emphasizing in connection with the contraction allowance; that is the amount of oversize dimension applied to master patterns and/or dies, to ensure that the resultant castings do not come out to undersize as a result of the total shrinkage arising during the manufacturing process.

DATA DESIGNED TO MINIMIZE ONE CAUSE OF PRODUCTION VARIATION

Fig. 2 demonstrates the results obtained from a fair number of such checks, the plotted points representing the mean contraction in terms of thousandths of an inch of "as cast" dimensions up to 4½ in. The original population of readings was coded in terms of solid dimensions, void dimensions (*e.g.*, a bore diameter) or combination of solid and void (as in the external diameter of a tube), but as no significant shift of contraction level could be found, they have subsequently been regarded as one population.

New Formula

The results of this work indicated immediately why, on the larger castings, even when they were

adequately fed to give a high standard of soundness, a standard contraction allowance of 0.020 in. per in. appeared to be inadequate, and die adjustments of an arbitrary nature were infrequently necessary. The fact was that a straight line of differing slope to that of 0.020 in. per in. was the "line of best fit" through the plotted points. A mathematical formula for this line was found to be $0.1 + \frac{102.5}{100}(C - 0.1)$, where C is the required mean casting dimension in inches.

Two points of interest are: (1) the "line of best fit" does not go through the origin, but is zero at 0.1 in., and (2) in the vast majority of cases (dimensions up to 1 in.) there is little difference between the new formula and the simple 0.020 in. per in. contraction rule, thus explaining why this originally seemed adequate and correct, and in many cases caused no difficulties.

Since applying the above modified formula, considerable improvement in achieving required mean casting dimensions has resulted. It is not, of course, suggested for one moment that any other investment foundry could use this formula, as materials and production conditions vary from plant to plant. It is noteworthy that the production relating to Fig. 2 was almost entirely that of austenitic stainless- and heat-resisting steels.

LIMIT ON CASTING TOLERANCE

To revert to the dimensional tolerance ranges, detailed analysis has shown certain grounds for suggesting that, on the smallest dimensions better than ± 0.005 in. can often be obtained. Thus, where no adverse factors exist, the investment founder might reasonably offer to supply "as cast" dimensions as follows:

0.000 in. to 0.25 in., ± 0.003 in.
0.25 in. to 0.50 in., ± 0.004 in.

Removing Ingates and Feeder-heads

The foregoing comments centre on the problems involved in achieving "as cast" dimensions, *i.e.*, the foundry aspects. However, every casting must have some area or areas where it must be separated from the ingates or feeder-head. The separation may take the form of cutting by friction saw, abrasive disc or cutting torch, and the cut area consequently requires cleaning up by grinding or linishing. Where these areas are non-critical, or where a machining allowance has been incorporated, only semi-skilled hand-finishing is called for. Where, however, the tolerance required is of the order of ± 0.005 in. or even closer, and where the customer is unable to accommodate such finishing, the investment founder is obliged to extend his activities outside the scope of foundry practice, and employ a different class of labour. In many cases, however, simple gap gauges may be used to aid in linishing the ingate area dimensions to the required limits. Naturally this can also apply to areas other than the ingate areas, *e.g.*, portions of the castings where the "as cast" variation is not controllable to the limits called for. After final heat-treatment, shotblasting, etc., the casting then shows no evidence of this finishing operation, and the resultant component is indistinguishable from an "undoctored" lost-wax casting. The resulting implication is that the process is far more accurate than in fact it is.

High Cost of Machining

It is well known that some investment foundries, *e.g.*, those tied to aircraft firms, are integrated with engineering workshops, and it is natural for them to approach production of components from the general standpoint of engineering as distinct from foundry products. As such, it is relatively easy for them to consider the overall cost of the completed component, rather than the piece cost of the casting.

For the designer and the buyer of investment castings as "bought out goods" from an investment foundry, the position is rather different. The foundry hopes to operate as a foundry without the added expense of a complete machine-shop designed to produce components to tolerances which the casting process is incapable of meeting. The cost of such dressing operations to fine limits and machining practice, adds considerably to the cost of the component, and is usually completely out of balance to the actual cost of producing the casting.

Where a foundry undertakes such work, it follows that in many cases it must be cheaper to have these engineering operations integrated with the customers' own machining operations, in which case the "two step" procedure means that too high a price is paid for the so-called casting. Conversely, in other cases, it is a great convenience for the customer to receive components ready for immediate use, even if the foundry has had to finish them. It is not surprising, therefore, that with the different practices employed by investment foundries, the buyer and designer at large is at a loss to establish what is to be expected as an investment casting.

It is hoped that the foregoing will have succeeded in clarifying the position of the investment founder, who attempts to compromise between the price which puts the precision casting out of court and at the same time endeavours to give the customer what he is asked for. Finally, however, it is hoped that present and potential users of investment castings will more readily appreciate the considerable mutual advantages to be gained from technical collaboration with the founder, from the design and inquiry stage.

Acknowledgments

The authors gratefully acknowledge the encouragement afforded to them in the preparation of this paper by Mr. A. E. Thornton, and the permission of their company to offer it for publication.

Raw Material Markets

Iron and Steel

Pig-iron outputs continue at record levels from the reduced number but increased capacity of blast furnaces, and production is at an annual rate of over 16,000,000 tons. More than 80 per cent. of this is basic steelmaking pig-iron, and supplies are readily absorbed to satisfy the record ingot production. The scrap position in steelworks shows little improvement and demands are not fully met, necessitating the use of more pig-iron.

Production of foundry grades of pig-iron keeps pace with demands and foundries have no difficulty in meeting stock and consumption needs. This discourages forward buying and foundries are confining bookings to two or three weeks ahead.

Engineering and speciality foundries continue to use substantial quantities of low phosphorus irons together with hematite and some refined irons. There is no lessening of their requirements, particularly from foundries supplying high-quality castings to the motor industry. Labour is short but outputs of castings are as near capacity as possible and many other establishments are busy with demands from other consumers. Overall outputs of low phosphorus iron are adequate, although some users cannot get full quantities of preferred brands. Hematite and refined irons are also easy to come by.

High phosphorus pig-iron is plentiful and deliveries are satisfactory. Many light foundries are well employed in supplying castings but are not working at capacity. Some foundries have thus taken on other types of castings, mainly for the light engineering trades, from which demands are good. Jobbing and textile foundries are fairly well employed but more work, particularly for forward delivery, is required.

Foundry coke deliveries continue satisfactory but may be affected by a strike at some Welsh coke ovens. The supply of scrap is sufficient, with the better and heavier types of steel and cast-iron scrap in greatest demand. Ganister, limestone, and firebricks are plentiful.

The re-rollers continue to work at capacity and demands are still heavy for small bars, light sections, and reinforcing rods. Shortage of labour continues to affect production and although there has been an improvement in the supply of steel semis, deliveries from home steelworks are below demands, particularly for 2-in. billets. Imported consignments will relieve this position. All arisings of suitable defectives and crops are readily taken up.

Non-ferrous Metals

The settlement of the strike in Chile towards the end of last week shook the London copper market and prices dropped by a total of £13 12s. 6d. a ton on the week to their lowest level for nearly six months. Rumours of an impending agreement in front of the actual settlement started the slide in prices which was furthered by statistics released in the US which showed a rise in fabricators' stocks and a decline in orders. Moreover, the president of Union Minière made a statement to the effect that over-production of copper in the world is possible during the coming months if there are no strikes and producers do not restrict their output to realistic levels.

However, copper is firmer in London this week in spite of a reduction in the Belgian quotation and a rise in stocks to 4,038 tons, an increase of 120 tons in the week. The much improved supply position is reflected in the closing up of the backwardation to around £2 a ton. In the US a squeeze developed for prompt metal, but otherwise demand continues slow with 33 cents a pound being the quotation applicable to both custom smelters and producers.

The outlook for copper is now focused on the disturbances in the Belgian Congo and the uncertainty injected into the market by the impending granting of independence at the end of this month. Meanwhile, in the absence of any fresh influence copper prices in London are likely to drift.

Tin has been a better market in New York and in Singapore than in London. In London, stocks continue to increase and at the end of last week totalled 8,388 tons. Demand is only fair and to some extent this has been attributed to the uncertainty arising from the United Nations Tin Conference at which the delegates are discussing the draft of a proposed new International Tin Agreement. In the US demand has improved and the price is now over $1 a pound.

Lead has been a patchy market, mainly because of the expected arrival of foreign supplies. Prices have widened somewhat and a contango has emerged of over £1 a ton. In the US the market is experiencing good trading conditions, which have been helped by strikes in various plants and the possibility of further strikes materializing. The US price is unchanged at 12 cents a pound.

Zinc is also an irregular market in London and although consumption is at a satisfactory level the appearance of a small contango reflects the satisfactory state of prompt metal at the moment. The New York market is quiet and the price is unchanged at 13 cents a pound. In Canada, it is interesting to note that the Consolidated Mining & Smelting Company has increased its quotation for Prime Western zinc by ¼ cent to 13 cents a pound.

Three New Aircraft Standards

The publication of three new standards in their "aircraft" series is announced by the British Standards Institution. Relating to magnesium-base ingots and castings, the standards have been issued to complete the recent series published in association with British Standard L.101. The specifications, which replace DTD 708, DTD 721A and DTD 748 respectively, are: L.126—magnesium-cerium-zinc-zirconium alloy ingots and castings; L.127—magnesium-zinc-zirconium alloy ingots and castings, and L.128—magnesium-zinc-cerium-zirconium alloy ingots and castings. They are in the new format recently adopted for BSI's aircraft series standards. In transferring the specifications from the DTD series only minor technical changes have been made, but the text has been aligned with the revised British Standard L.101 and approximate metric equivalents have been inserted. Copies of these standards may be obtained from the British Standards Institution, Sales Branch, 2, Park Street, London, W.1: price 3s. (Postage will be charged extra to non-subscribers.)

PRESSED STEEL COMPANY, LIMITED, are extending their works at Linwood, Paisley, to enable them to produce, among other things, cabs for commercial vehicles. They have in mind the needs of the B.M.C. factory to be built at Bathgate. The extension will be a 260,000 sq. ft. plant—Linwood's existing floor space is about 1,000,000 sq. ft.—which will be built on land immediately adjoining the present works and devoted almost entirely to car-body production lines. Although Linwood is being extended into a major car-body factory, it will remain the headquarters of Pressed Steel's railway-wagon and rolling-stock construction.

Current Prices of Iron, Steel, and Non-ferrous Metals

(Delivered unless otherwise stated)

June 1, 1960

PIG-IRON

Foundry Iron.—No. 3 IRON, CLASS 2, 10-ton lots or over: Middlesbrough, £21 6s. 0d.; Birmingham, £20 18s. 3d.

Low-phosphorus Iron.—Over 0.10 to 0.40 per cent. P, 10-ton lots or over, £23 5s. 0d., delivered Birmingham, £23 10s. 0d., delivered Grangemouth.

Cylinder and Refined Irons.—North Zone, £25 6s. 6d.; South Zone, £25 9s. 0d.

Refined Malleable.—P, 0.10 per cent. max.; North Zone, £26 6s. 6d.; South Zone, £26 9s. 0d.

Hematite.—Si up to 2 per cent., S. & P. over 0.03 to 0.05 per cent., 10-ton lots or over: N.-E. of England (local iron), £23 19s. 0d.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 7s. 6d.; Birmingham, £25 14s. 0d.; Wales (Welsh iron), £23 19s. 0d.

Basic Pig-iron.—£20 3s. 0d., delivered Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leicestershire in 10-ton lots or over.

FERRO-ALLOYS

(Per ton unless otherwise stated, delivered)

Ferro-silicon (6-ton lots and over).—45 per cent. Si, £41 10s. 0d. to £44 0s. 0d., scale 15s. 0d. per unit, lumpy; 75 per cent. Si, £57 0s. 0d. to £62 10s. 0d., scale 15s. 0d. per unit, lumpy.

Ferro-vanadium.—50/60 per cent., 22s. 6d. per lb. of V.

Ferro-molybdenum.—65/70 per cent., carbon-free, 12s. 10d. per lb. of Mo.

Ferro-titanium.—20/25 per cent., 2-3 per cent. Cu, £250 0s. 0d.; 38/40 per cent., commercially carbon-free, £287 0s. 0d.

Ferro-tungsten.—80/85 per cent., 11s. 11d. per lb. of W.

Tungsten Metal Powder.—98/99 per cent., 14s. 11d. per lb. of W.

Ferro-chrome (6-ton lots and over, lumpy).—4/6 per cent. C, £78 10s. 0d. to £82 10s. 0d., basis 60 per cent. Cr. scale 26s. 0d. to 28s. 6d. per unit; over 6 per cent. C, £77 0s. 0d. to £80 10s. 0d., basis 60 per cent. Cr, scale, 26s. 0d. to 28s. 6d. per unit; 2 per cent. C,* 1s. 8d. to 1s. 11d. per lb. Cr; 1 per cent, C,* 1s. 8½d. to 1s. 11½d. per lb. Cr; 0.15 per cent. C,* 1s. 9½d. to 2s. 0½d. per lb. Cr; 0.10 per cent C,* 1s. 9¾d. to 2s. 0¾d. per lb. Cr; 0.06 per cent. C,* 1s. 10¼d. to 2s. 1d. per lb. Cr.

Metallic Chromium.—98/99 per cent., 6s. 10d. per lb.

Metallic Manganese.—94/96 per cent., carbon-free £275 0s. 0d.; 9 6/98 per cent., £285 0s. 0d.

Ferro-columbium.—65/67 per cent., Cb + Ta, 19s. 9d. per lb., Cb + Ta.

Ferro-manganese (Standard).—78 per cent., £61 10s. 0d.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: soft u.t., 100 tons & over, £31 15s. 6d.; tested, 0.08 to 0.33 per cent. C, 6 to 35 tons, £33 15s. 6d.; hard (0.41 to 0.60 per cent. C), under 10 tons, £34 17s. 0d.; silico-manganese, under 10 tons, £43 16s. 6d.; free-cutting, under 10 tons, £36 14s. 6d. SIEMENS MARTIN ACID (under 10 tons): Up to 0.25 per cent. C, £41 1s. 0d.; silico-manganese, £44 4s. 0d.

Billets, Blooms, and Slabs for Forging and for Stamping (under 10 tons).—Basic, soft, up to 0.33 per cent. C, £38 10s. 0d.; basic, hard, over 0.41 up to 0.60 per cent. C, £39 12s. 6d.; acid, up to 0.25 per cent. C, £43 4s. 0d.

* Average 68–70 per cent.

FINISHED STEEL

Heavy Plates and Sections (1 ton to 10 tons).—Ship plates (N.-E. Coast), £41 12s. 0d.; boiler plates (N.-E. Coast), £44 2s. 0d.; floor plates (N.-E. Coast), £43 10s. 0d.; angles (N.-E. Coast), £38 16s. 6d.; joists (N.-E. Coast), £38 12s. 6d.

Small Bars, Sheets, etc.—Rounds and squares, under 3 in., and flats 5 in. wide and under, untested soft basic, 50 tons and over, £39 1s. 0d.; under 10 tons to 4 tons, £40 18s. 0d.; under 4 tons to 2 tons, £41 3s. 0d.; hoop and strip, coils, 100 tons and over, £38 0s. 0d.; uncoated strip mill coils, hot rolled, under 3 mm. to 12g., 25 tons to under 50 tons, £43 16s. 0d.; black sheets (hand mill), 24g., 10 tons and over. £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £68 5s. 0d.

Alloy Steel Bars.—1 in. dia. and up: Nickel, £67 17s. 0d.; nickel-chrome, £98 11s. 0d.; nickel-chrome-molybdenum £111 4s. 0d., in lots of 5 tons to under 10 tons.

NON-FERROUS METALS

Copper.—Cash, £240 10s. 0d. to £241 0s. 0d.; three months, £238 15s. 0d. to £239 0s. 0d.; settlement, £241 0s. 0d.

Copper, Tubes, etc.—Solid-drawn tubes, 2s. 4¾d. per lb.; rods, 261s. 6d. per cwt. basis; 20 s.w.g., 296s. 6d. per cwt.

Tin.—Cash, £782 0s. 0d. to £782 10s. 0d.; three months, £783 10s. 0d. to £784 0s. 0d.; settlement, £782 10s. 0d.

Lead (Refined Pig).—First half June, £76 2s. 6d. to £76 5s. 0d.; first half September, £76 7s. 6d. to £76 10s. 0d.

Zinc.—First half June, £91 5s. 0d. to £91 10s. 0d.; first half September, £90 15s. 0d. to £91 0s. 0d.

Zinc Sheets, etc.—Sheets, 15g. and thicker, all English destinations, £126 5s. 0d.; rolled zinc (boiler plates), all English destinations, £124 0s. 0d.; zinc oxide (Red Seal), d/d buyers' premises, £105 0s. 0d.

Brass Tubes, etc.—Solid-drawn tubes, 1s. 11¾d. per lb.; sheets to 10 w.g., 211s. 6d. per cwt.; wire, 2s. 9d.; rolled metal, 211s. 6d. per cwt.

Brass (Brazing).—BS1400, B3, £167; B6, £219.

Brass (High Tensile).—BS1400, HTB1, £195; HTB2, £216; HTB3, £230.

Gunmetal.—BS1400, LG2, £208; LG3, £217; G1, 1%, £272; G1, 1%, £259.

Phosphor Bronze.—BS1400, PB1 (AID released), £304; BS1400, 90/10/1, £293.

Leaded Phosphor Bronze.—BS1400, LPB1, £229.

Phosphor Bronze Strip, etc.—Strip, 298s. 6d. per cwt.; wire, 4s. 2d. per lb.; rods, 3s. 4¾d.; tubes, 3s. 4¾d.; chill cast bars, solids 3s. 4¾d.; cored 3s. 5¾d. (CHARLES CLIFFORD, LIMITED).

Nickel Silver, etc.—Rolled metal, 3 in. to 9 in. wide × 0.056, 3s. 11¼d. per lb.; round wire, 10g. in coils (10 per cent.), 4s. 4¼d.; special quality turning rod, 10 per cent., ½ in. dia., in straight lengths, 4s. 4d. All prices are net.

Other Metals.—Magnesium, ingots, 2s. 2½d. to 2s. 3d. per lb. Antimony, English, 99 per cent., £190 0s. 0d. Quicksilver; ex-warehouse, £70 10s. 0d. to £71 0s. 0d. Nickel, £600 0s. 0d. Aluminium ingots, £186 0s. 0d.; aluminium bronze (BS1400), AB1, £250, AB2, £259.

Publications Received

Better Plating on Die-castings. Published by the British Non-Ferrous Metals Research Association, Euston Street, London, N.W.1; price 7s. 6d.

The deterioration of plating, particularly on motor cars, has caused a certain amount of criticism in recent years. Many of the components, door handles, lamp bezels and boot hinges, for example, are made from zinc-alloy die-castings and these plated die-castings have come in for special comment because corrosion results in permanent disfigurement of the plating by blisters.

To some extent, the tendency for the plating to break down can be blamed on the use of too thin a deposit of nickel under the chromium and the latest British Standard for nickel/chromium plating calls for nearly double the amount of nickel formerly specified. Even so, under the severe test of day-to-day exposure to a polluted city atmosphere additional protection is required.

One approach is to improve the coating of chromium on top of the nickel, taking advantage of the inherently high-corrosion resistance of chromium. At the moment only an extremely thin chromium coating is used (about 0.00001 in. thick) and the nickel plating underneath is relied on for corrosion protection. The main reason for this has been that thicker deposits of chromium tend to crack and lose their protective value. Research has now shown how to overcome this difficulty, at least partially, to produce coatings two or three times as thick without cracks developing.

The BNFMRA Report on "Better Plating on Die Castings" shows that the extra corrosion resistance of the plating is quite remarkable even though the chromium coating is still well below 1/10,000 in. thick.

While it would be wrong to claim indefinite life for this new chromium plating, the use of which is not confined to die-castings, its adoption should result in much better serviceability from plated components.

Buyers Guide (1960 edition). Published by *The Engineer*, 28, Essex Street, London, W.C.2, price 9s. 3d., post free.

The 1960 edition of this Guide is confined to firms which advertise in *The Engineer*, but as they total 1,849, the listing is quite comprehensive. The Guide contains a list of associations, institutes and societies connected with the engineering industry, but there are a few omissions, such as the National Society of Master Patternmakers and the Foundry Trades' Equipment and Supplies Association, which surely enter this category. The general arrangement of the Guide is to list alphabetically the various commodities and plant which engineers buy and to give the names and addresses of the firms listed. To simplify the references, a number of sub-divisions have been incorporated, such as those covering machine-tools and chemical plant. The whole makes an extremely useful work of reference.

As PART of their sales drive in the "Outer Seven" and Common Market countries, J. H. Carruthers & Company, Limited, of East Kilbride, have sent a demonstration unit for a three-week tour of Norway, Sweden and Denmark. A second tour to Belgium and Holland will take place later this year.

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Notes from the Branches

Natal Section

"Lead/Tin Patternmaking" was the subject of a paper presented by Mr. G. Thompson to the Natal section of the IBF in January. Mr. Thomson, who relied mainly on demonstration for the presentation of his lecture, dealt with the making of patterns for the cooking-stove trade. He described how a hob with six cooking plates was made for a Dover stove. In this particular case, where the metal thickness is only $\frac{5}{32}$-in. thick, the advantage of using a lead/tin alloy instead of wood was obvious, said Mr. Thomson.

Mr. A. W. Bird, senior vice-president of the section, read a paper entitled "The Right Metal for the Job" at the March meeting of the section. Mr. Bird dealt with the non-ferrous alloys, dividing the paper into two main parts covering copper-base metals and aluminiums, and concluded with a few remarks on zinc-based metal.

On the subject of brasses, the author said that for products such as water taps, pipe fittings, etc., the metal usually contains about 65 per cent. copper, and to improve machinability and pressure tightness approximately 2 per cent. lead is added. Tin, an objectionable constituent, was added to the so-called naval and admiralty brasses in order to improve their resistance to a troublesome form of corrosion known as dezincification.

Bronzes, metallurgically speaking, were alloys consisting mainly of copper and tin, with or without additions of lead and/or phosphorus. A mixture of 90 per cent. copper with 10 per cent. tin gives a very strong, tough and corrosion-resistant metal for such purposes as pump impellers, and by increasing the tin content to 12 per cent. an even harder metal is obtained which is used for gear wheels, etc. Gunmetals and aluminium-bronzes were then briefly dealt with.

The author divided the aluminium section into two groups: those that are heat treatable and those that are not. He strongly advised foundrymen to avoid the heat-treatable group unless thermostatically-controlled electric furnaces were available. A hearty vote of thanks rounded off the evening.

Australia (Victoria)

The Australia (Victoria) branch held its April meeting in the Metallurgy School of the Royal Melbourne College, when the business of the meeting being concluded, a lecture on "Making Steel in the Iron Foundry" was delivered by Mr. D. L. Bryant. A lively discussion followed presentation of the paper, and as usual the meeting concluded with a light supper.

Birlec Furnace for India

A contract has recently been placed with Birlec-Efco (Meltung), Limited, by Electro Metallurgical Works Private, Limited (India), for a special direct-arc melting furnace. It is to be installed at Dandeli, which is in the state of Mysore, India. When completed, it is believed that it will be the only furnace of its kind in India. The furnace, arranged for 90-deg. nose tilt, will be hydraulically tilted. Rated at 1,200 kva., the plant will be used for the production of ferro-manganese. Some of this will be supplied to the new Durgapur steelworks for use in the production of special steels.

The contract, which has a total value of about £40,000, was secured by Birlec-Efco against severe Continental competition.

Law Cases

Fitter falls from Overhead-crane Gantry

The provision of guard rails or safety belts issued to men working on overhead cranes at Stanton Ironworks was recommended by the jury at a Nottingham inquest, on May 24, on a fitter's mate who died in hospital after falling from an overhead-crane gantry at the works. Mr. G. W. Hodgson, for the company, said that safety belts were available to the fitters if they wished to wear them. A verdict of accidental death was returned on Mr. Clifford Boultbee, 55 years old, who had died on May 12.

Boultbee was fixing safety stops along the track of an overhead crane. Mr. Cyril Dawson, a maintenance fitter, who was working with Boultbee, said he had turned away from him to fit a channel over the safety block he was fixing, when he heard Boultbee shout. "I turned round but he had gone. He may have been following me to give me a hand and lost his balance, or he may have been returning to the wharf-way." Mr. Dawson then said that there had been a slight breeze, and it had been raining, but the track was not slippery: "I thought he was firmly standing on the crane. There were a number of things on which he could have held for support." It was stated in court that Boultbee had been Dawson's mate for 3½ years, and they had been on crane work most of the time; he was experienced and competent in crane work, and they had been on the job concerned for five weeks. In reply to Mr. A. J. Drury, for the dead man, Dawson said work was stopped after the accident. No protective scaffolding had been erected.

Mr. A. C. G. Rothera, Nottingham city coroner, said the position of the fitter and his mate must have been, at the least, a very delicate one. They were engaged in a very special type of work, and it might be that there was no recognised method of doing it other than the one used: "It seems fairly obvious that, having handed the cover and bolts to Mr. Dawson, he stepped over the plates on which he had been astride and may have been intending to move towards him to help him. It is possible he could have tripped over the bar, causing him to lose his balance."

Production Starts at Durgapur

During the last two weeks, the two primary rolling mills at the Durgapur steelworks, being built by Iscon in West Bengal, India, have come into production on schedule. During the first day, 250 tons of ingots were rolled—the first step towards an annual production of 800,000 toss of saleable rolled-steel products. Already, over 100,000 tons of pig-iron have been produced from the first blast-furnace, which was inaugurated at Durgapur in December, 1959, by the President of India. With the addition of further coke-ovens, a fourth blast-furnace, more steelmaking furnaces, soaking pits and finishing mills, the capacity of the plant will be raised to 1,600,000 ingot tons per annum. The layout at Durgapur has been arranged so as to allow space for future plant to be installed, to enable this output to be raised to between 2,500,000 and 3,000,000 tons per annum.

CEMENTATION COMPANY, LIMITED—Mr. F. G. Atherton has resigned as a director due to ill-health. He will continue to serve in a consultative capacity.

WOLVERHAMPTON METAL COMPANY, LIMITED—Mr. F. W. James and Mr. K. R. H. James have been appointed joint managing directors with Mr. A. M. Anderson.

Baker Perkins Foundry Machinrey at work . . . *at Joseph Bloomer & Sons Ltd.*

This 'Cadet' Rotary Table Shot Blast machine has been installed at Joseph Bloomer & Sons Ltd. where its high standard of finish and sound design have made it an extremely useful addition to this company's foundry equipment. This machine includes our patented bi-phase impeller system with low power consumption. No pits or special foundations were necessary. Please write for full details.

Baker Perkins Ltd.

Foundry Machinery Division

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PHONE : JARROW 897124

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HISTORICAL NOTE

Joseph Bloomer & Sons Ltd. were established in 1860. At their Ladysmith Foundry and Chain Works, which are in Cradley, Staffordshire, they produce a wide range of castings for gas and calor gas cookers, agricultural and textile machinery, the motor industry, continuous burning fires and stoves and many other applications.

Company News

LONDON ALUMINIUM COMPANY, LIMITED—Group net profit rose from £46,711 to £66,148 and a final dividend of 10 per cent. makes 12 (10) per cent. for 1959.

EDWARDS HIGH VACUUM, LIMITED—The chairman, Lord Wilmot, announced at Wednesday's meeting in London that the scrip issue would be on a one-for-two basis.

UNIVERSAL GRINDING WHEEL COMPANY, LIMITED—The interim on the ordinary capital is being raised to 7½ (5) per cent., tax free, and forecasts of a final of 12½ per cent. would make a total dividend of 20 (17½) per cent.

METAL INDUSTRIES, LIMITED—Terms of the forthcoming rights issue are one £1 ordinary share at 54s. for every £4 ordinary stock held on May 2. Of the total, 20s. a share will be payable on acceptance on or before June 17 and the balance on or before July 30.

HATTERSLEY (ORMSKIRK), LIMITED, engineers, iron and non-ferrous founders, of Ormskirk (Lancs)—Final dividend of 15 per cent. makes 20 (17½) per cent. for the year ended March 31, 1960. Group net profits rose from £289,740 to £357,141, after tax of £299,116 (£296,201).

BUTTERLEY COMPANY, LIMITED, ironmasters, ironfounders, etc., of Butterley, near Derby—A further capital distribution of 6d. per 2s. 6d. share is being paid for 1959, making 9d. per share, against 4d. for 1958. Group profit for the year is £103,427, against a loss of £683,796.

STONE-PLATT INDUSTRIES, LIMITED—Group profits for 1959 fell from £2,673,739 to £2,106,536, but the outlook for 1960 is encouraging and results for that year should show a definite improvement, it is stated. A final dividend of 11 per cent. maintains the total of 15 per cent. for the year.

HEAD, WRIGHTSON & COMPANY, LIMITED—Group trading surplus fell from £1,815,173 to £1,648,515 in the year to January 31, 1960, and the net profit was down from £874,654 to £803,758, after tax of £628,580 (£636,011). A final dividend of 10 per cent. makes 14 (13½) per cent. for the year.

PEGLERS, LIMITED, brassfounders, engineers, etc., of Doncaster—The dividend for the year ended March 31, 1960, is raised from the equivalent of 15 per cent. to 16½ per cent. on capital increased by a one-for-two scrip issue. Net profit rose from £257,688 to £344,350, after tax of £329,000 (£266,000).

WAKEFIELD CHAMBER OF COMMERCE decided at a meeting on May 23 not to support a resolution of the Yorkshire Council of Further Education for the cessation of evening classes. It was stated that the Council felt that no boy or girl under 18 should be expected to follow a course relying upon evening-only classes, and that such classes should be allowed to lapse during the next two years. Commenting on this, some members of the Chamber suggested that day-time release from work to attend further education would lead to young people going only in order to get away from work. Mr. R. Sutcliffe then said that there were many concerns which allowed employees to attend instruction in the day time only if they also went two or three evenings a week. If they failed to go in the evenings, then the employers had the right to end the day-time attendance.

Prices a Problem for BICC

The main problem for British Insulated Callender's Cables, Limited, in 1960, will be the prices at which goods are sold, particularly low-voltage mains and wiring and general cables, said the chairman, Mr. W. H. McFadzean, in his annual statement. He believes there will be plenty of business available and the company would certainly endeavour to take its full share, he said.

Referring to the major re-orientation of trade arrangements in 1959 for the home market in the cable industry, Mr. McFadzean said: "We in BICC have given a lead to the industry by raising prices to some extent, although these have by no means brought us back to overall ecomonic levels." The achievement of this must remain one of the objectives and there were encouraging signs that other companies were thinking similarly, he declared.

Mr. McFadzean went on: "To my mind the most important single factor is whether the self-discipline which several companies have imposed will be sustained. It is too early to be definite, but I think there are good hopes that it will. If it is, then 1960, while not producing satisfactory results in this range of our products, may prove a very important year in that it may witness stability being reintroduced into the cablemaking industry on which a more economic future can be built."

Group sales rose from £110,000,000 to £128,000,000 in 1959, of which £38,000,000 represented exports from the UK and sales of oversea companies. Group net profit increased from £3,292,989 to £4,231,569 and the dividend is 13½ per cent. (same on smaller capital).

David Brown Orders increase

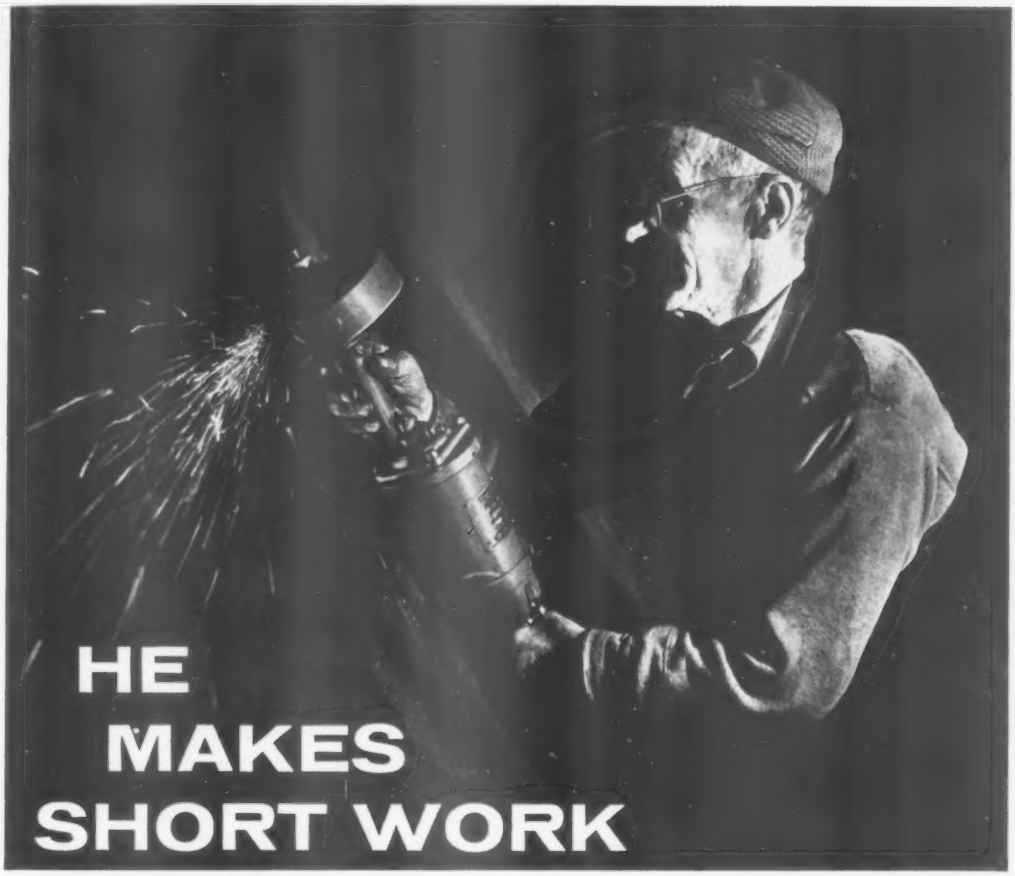
Orders received by the general engineering side of the David Brown Corporation, Limited, during the current financial year are over £2,000,000 in excess of those received at this period last year, says Mr. David Brown, chairman and managing director, in his annual review. He adds that the foundry division, which last year showed signs of a weakening order-book, is now more than fully occupied.

Whatever the outcome of the current year, which should be considerably more profitable, Mr. Brown continues, 1960 will be a notable year because it marks the company's centenary. "It is a far cry from my grandfather's original pattern shop serving a local market in the West Riding of Yorkshire to the present David Brown Organization known for its products and engineering techniques in every country of the world, and it will be our aim in the second century of our existence to develop and expand our business still further so as to make it truly international in scope," he says.

Newton Chambers to acquire Sheet-metal Business

At the annual meeting of Newton, Chambers & Company, Limited, ironfounders, engineers, etc., of Thorncliffe, near Sheffield, the chairman, Sir Peter Roberts, announced that the company proposed to acquire the business of Rhodes & Halmshaw, Limited, sheet metal workers, of Ossett, Wakefield.

He added that some 70 per cent. of Rhodes & Halmshaw's business comprised work done for Newton Chambers, particularly for the excavator division.



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News in Brief

IN A NEW block of offices for the Yorkshire Engine Company, Limited, the whole of the top floor is laid out as a drawing office.

JUBILEE of Jackson Bros. (Milton), Limited, non-ferrous founders, of Stoke-on-Trent, was marked by a civic visit by the Lord Mayor on Wednesday, May 25.

CHANGE OF NAME is announced by Niagara Screens (Great Britain), Limited. In future the company will be known as Niagara Screens & Plant, Limited. The address remains unchanged.

A NEW BRANCH at Gladstone Road, Portslade, Brighton, Sussex, which centralises control of South Coast distribution, has been opened by Domestos, Limited, Newcastle-on-Tyne.

NEW NOTTINGHAM address of the Cambridge Instrument Company, Limited, London, S.W.1, is Century Insurance Building, Milton Street, Nottingham (telephone: Nottingham 42612).

ROYCE ELECTRIC FURNACES, LIMITED, have now moved into a well-equipped factory at Albert Drive, Sheerwater, Surrey, where both standard and special heat-treatment furnaces are to be built.

PARTY of 25 apprentices and senior officials from Bulltabriks AB, Sweden, visited the works of South Wales Switchgear, Limited, at Blackwood, last week. The apprentices paid the cost of the trip themselves.

TWO MEMBERS of the girls' club of the Stanton Iron works Company, Limited—Sandra Jordan and Joyce Ford—went to Buckingham Palace recently to receive from the Duke of Edinburgh awards for having reached the gold standard in the Duke's awards scheme.

ENGINEERING FIRM of British M.A.R. Company, Limited, Grantham (Lincs), is to take over adjoining factory buildings and expand its works. Working in association with American and Austrian companies, the company will increase its range of products.

NATION-WIDE CAMPAIGN by the West German Metal-workers' Union for a 10 per cent. pay increase has been extended to Bavaria, where about 850,000 workers are affected. Similar claims have been lodged or already negotiated in all other parts of West Germany except the Saar.

ABOUT 450 members of the staff of Newton Chambers & Company, Limited, Thorncliffe, near Sheffield, were the guests of the managing director, Mr. P. J. C. Bovill, the Master Cutler, at a reception and dance at the Cutler's Hall, Sheffield, on May 20, to celebrate his year of office.

AN AGREEMENT has been concluded between Rubery Owen & Company, Limited, structural and manufacturing engineers, of Darlaston, Wednesbury (Staffs), and the unions for a 40-hour working week with no tea-breaks. The shorter week, which affects 6,000 workers, started on May 21.

THE SUCCESS of the 14 attractive new colour schemes recently introduced on the New World Rado-Vecta fire has enabled Radiation, Limited, to reduce the price of these units. All the colours were selected from the British Standard Range, and chosen to blend with the latest shades used in interior decoration.

EMPLOYERS IN 70,000 ESTABLISHMENTS in the manufacturing and certain non-manufacturing industries in Great Britain are to be asked by the Ministry of Labour for more information about the earnings of 7,000,000 workers employed by them, in the half-yearly enquiry which the Ministry is conducting in October.

THE CARNEGIE LIBRARY OF PITTSBURGH (4400, Forbes Avenue, Pittsburgh, 13, Pennsylvania, USA) announce that arrangements have been made with a technical journal to print their "Review of Iron and Steel Literature for 1959." They hope to distribute reprints during the late summer to those on their mailing list.

HOPE that new light industries would be attracted to Tees-side was expressed by Mr. J. H. Patchett, director and general works superintendent of Dorman Long (Steel), Limited, at the 91st annual dinner of the Middlesbrough and District Foremen Engineers and Chief Draughtsmen's Association at Thornaby-on-Tees.

SHEFFIELD'S APPRENTICE-OF-THE-YEAR, 20-year-old David Garnett, left on May 24 for a 14-day free educational visit to Stockholm, as the guest of the Stockholm Junior Chamber of Commerce. He is accompanied by Mr. R. M. Fix, who is representing Sheffield at the European Congress of the Junior Chamber International.

ROSE, DOWNS & THOMPSON, LIMITED, of Old Foundry, Hull, a member of the Power-Gas group, has received two contracts valued at nearly £200,000 for complete vegetable-oil mills, both of which incorporate refining and deodorizing equipment. The first mill is to be erected in West Africa and the second is destined for the West Indies.

GENERAL REFRACTORIES, LIMITED, Worksop; Pickford Holland & Company, Limited, Sheffield; the Swinden laboratories and Steel Peech & Tozer branch, Rotherham, were among the works visited on May 24 and 25 by delegates attending the International Ceramic Congress, which opened in London on May 23.

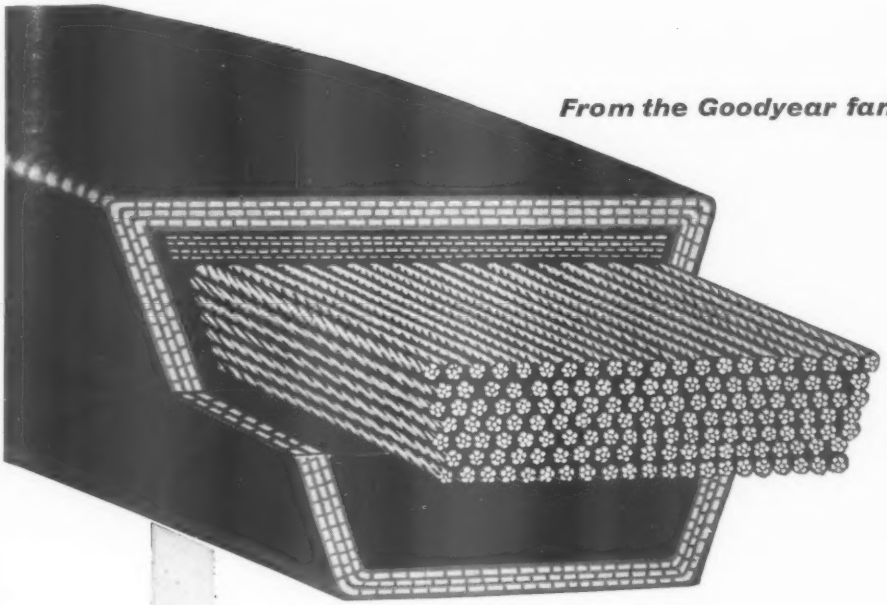
MEMORIAL to George Stephenson, the railway pioneer, was dedicated by the Bishop of Derby, the Right Rev. Geoffrey Allen, at Holy Trinity Church, Chesterfield, last week. The memorial was paid for out of funds collected by a committee which has been working on the project since the 1930s and takes the form of a communion table and altar furniture and fittings.

INTEREST in the development of the Hovercraft has been announced by William Denny & Bros., Limited, the Dumbarton shipbuilders and engineers. Mr. G. R. Denny, the office manager, said that the company was in negotiation with Hovercraft Developments, Limited, the subsidiary of the National Research Development Corporation which sponsored the development of the craft.

TWO FACTORIES, occupying more than seven acres on the Bromborough Port Industrial Estate, Merseyside, have been bought by Joseph Lucas (Industries), Limited, Birmingham, in readiness for the growth of the motor industry on Merseyside. The company is believed to have paid £200,000 for the factories, which were owned by Metal Industries, Limited, and have nearly 100,000 sq. ft. of floor space.

ACCORDING to *Overseas Review*, published by Barclays Bank D.C.O., the Aluminium Company of South Africa is to proceed immediately with the first step in a £2,500,000 production expansion programme. In Northern Rhodesia, a South African concern, Scaw Metals, Limited, has acquired a controlling interest in the foundry and grinding-materials business of Tow Brothers Iron Works at Kitwe.

PITHEAD COAL STOCKS in the European Coal and Steel Community in April continued the rising trend which has been in evidence since the end of February. Provisional figures published by the High Authority show stocks at the end of April at 31,920,000 *tonnes*, against 31,315,000 a month earlier and 30,368,000 at the end of February. At the end of April, 1959, pithead coal stocks stood at 30,210,000 *tonnes*.



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News in Brief

THE EIGHTH ANNUAL DINNER of the Fry 25 Club was held recently at the Trocadero, London. This function, which was organized by the Fry's group of companies, which embraces the Eyre Smelting Company, Limited, is held specially for members of the staff who have served for 25 years or more. Presiding at the dinner was this year's chairman, Mr. L. G. Morrish, who is the manager of Fry's Manchester branch.

AFTER HEARING an application by the Federation of British Hand Tool Manufacturers and the National Federation of Engineers' Tool Manufacturers, a standing committee appointed by the President of the Board of Trade recommended on Tuesday that imported tools should be required to bear an indication of origin. This indication should be die stamped, etched, engraved, or moulded on the tool and the carton or container should also be suitably marked.

JESSOP-SAVILLE (SMALL TOOLS), LIMITED, Sheffield, announce that they have bought a factory in Fitzwilliam Road, Rotherham, formerly occupied by the Plessey Company, Limited, for the manufacture of cemented carbide-tipped tools and butt-welded high-speed tools of all types. The premises are to be modified, and the firm expects to be in occupation before the end of the year. About 100 people will be employed at first, but the firm has also bought the site as well as the factory to permit future extensions.

TECALEMIT, LIMITED, have entered into an arrangement with Smith & Grace (Sales), Limited, which will result in improved service to users of mechanical lubrication equipment. Under the new arrangement improved regional stocks are to be held by Tecalemit's area distributors, and these will be supported by considerably enhanced stocks held by Smith & Grace as main distributors. Improved technical representation is being provided by regional representatives working in co-operation with the local distributors.

FIRTH-VICKERS STAINLESS STEELS, LIMITED, Sheffield, held their first general sales conference since 1947, at Brookfield Manor, Hathersage, Derbyshire, on May 23. Agents from 21 countries, as well as home sales staff, took part. The conference was opened by Mr. J. T. W. Dewar, managing director, under the presidency of Mr. H. Wentworth Ping, and was followed in the evening by a dinner at the Royal Victoria Hotel, Sheffield. The following day a visit to Firth-Vickers and Shepcote Lane Rolling Mills was organized for all concerned.

AN ACCIDENT occurred in the Alsing Road Foundry of Millspaugh, Limited, on April 18. Fifteen tons of molten metal was being poured into a centrifugal-casting machine when, during the operation, metal burst through the front end. The resultant spray of metal injured 10 men, one of whom was detained in hospital, the remaining nine being able to return to work after treatment in the works medical centre. Due to the prompt action of the fire brigade of the parent company —Hadfields, Limited—damage was confined to the area around the machine.

DRAUGHTSMEN AND TRACERS at Ruston & Hornsby, Limited, the Lincoln engineers, who had threatened to go on strike on May 23, have continued at work as usual at the special request of the management. They held a special meeting and agreed to postpone action until further talks had been held between their negotiating committee and the management in an effort to reach a settlement. About 200 employees are affected by the dispute, which concerns the recognition of the Association of Engineering and Shipbuilding Draughtsmen minimum rates, and the maintenance of existing differentials.

A DECISION was taken by delegates attending the 1960 conference of standards engineers to bring together in an association all those concerned with the application of standards in industry. It was agreed that no separate organization—as was earlier envisaged—should be set up but that standards engineers and others with a special interest would be able to become associates, on a personal basis, of the British Standards Institution. Outlining the new proposals, the director of BSI, Mr. H. A. R. Binney, explained that the new associates scheme would provide "standards practitioners" with the forum they so evidently desired, in which they could meet, hold discussions and exchange views.

THE GENERAL ELECTRIC COMPANY, LIMITED, in association with Vacuum Industrial Applications, Limited, and the British Geco Engineering Company, has secured an order, approaching £100,000 in value, from Jessop-Saville, Limited, for the supply of an induction-melting furnace of one-ton capacity. It is scheduled for installation in the company's Brightside Works, Sheffield, by the end of the year. The furnace, which will operate at 1,700 deg. C., is designed for semi-continuous operation and has provision for casting under vacuum. Bulk charging and alloy addition can also be effected without breaking the vacuum. Power is to be supplied to the furnace at two frequencies, one of which will be used for heating, and the other for stirring the molten metal.

THE SUMMER MEETING of the Institution of Production Engineers, 10, Chesterfield Street, London, W.1, is to be held on June 27. At 2.45 p.m., the Viscount Nuffield Paper will be delivered by Sir Stanley Rawson, his subject being "Machine-tool Development and the National Economy, with Special Emphasis on Future Trends." In the evening, from 7.30 p.m. to midnight, there is to be the president's reception and conversazione for members and their ladies at the Royal Festival Hall, London. The programme will include dancing, concerts in the auditorium by the band of the Life Guards, cabaret by well-known artists and other attractions. The price of the tickets is £3 3s., and applications to attend should be made to the secretary of the Institution at the address quoted.

Obituary

The death occurred on Thursday of last week of Mr. CHARLES HAYES FRANKLAND, formerly a director of British Insulated Callender's Construction Company, Limited. He was 65.

Mr. ARTHUR PAUL SHELDON, who has died at the age of 72, was senior partner in A. P. Sheldon & Son, Limited, agricultural engineers, etc., The Forge, Little Aston, near Birmingham.

Mr. WILLIAM GWENNAP, the founder of the Bednall (Staffs) firm of agricultural machinery manufacturers, William Gwennap (Agricultural), Limited, has died. He built the business up and was its proprietor until three years ago when it was taken over by Rubery Owen & Company, Limited, Darlaston, Wednesbury (Staffs). Mr. Gwennap was 71.

The death has occurred suddenly at the age of 50 of Mr. STANLEY D. HODGSON, for the past 18 months technical director of the Tees Side Bridge & Engineering Company, Limited, Middlesbrough. He has previously served as draughtsman, works engineer, and assistant manager with the company. Mr. Hodgson was an active member of the British Standards Institution and of the Hot Dip Galvanizers Association.

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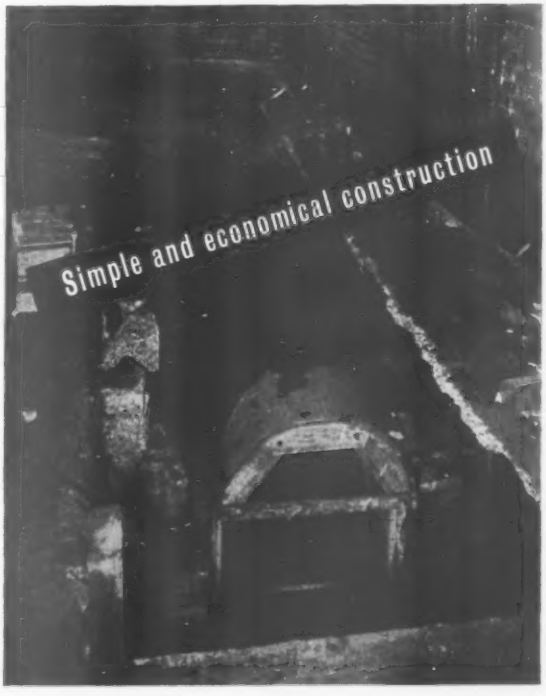

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Personal

Dr. R. H. WAGNER has been appointed full-time Lecturer in Geology at Sheffield University.

Mr. G. SMITH has been appointed training officer of Old Roundwood Colliery (Yorks) in succession to Mr. D. S. Byrne.

Mr. E. W. A. RICHARDS has been appointed a director of Keith Blackman, Limited. He retains his appointment as secretary of the company.

Cllr. HUBERT GIBLIN, a steelworker for 35 years at John Lysaght's Scunthorpe Works, Limited, was last week installed as Mayor of Scunthorpe.

Mr. J. R. BOTTOMLEY, Mr. E. GARLICK, Mr. D. MILNE and Mr. J. F. WALLACE have been appointed to the board of Jessop-Saville (Small Tools), Limited.

Dr. W. J. KROLL, of Corvallis, Oregon, will deliver the sixth Castner Memorial Lecture entitled "The Fusion Electrolysis of Titanium" in Glasgow on October 7.

Mr. IAN HEATON, manager for 31 years of the Lawkhome Lane saw mills of Prince-Smith & Stells, Limited, textile-machinery makers, Keighley, retired on May 18, after a total of 41 years with the company.

Chairman of the special sub-committee of the Shipbuilding Advisory Committee which is to study the future of the industry is to be Sir JAMES DUNNETT, Permanent Secretary to the Ministry of Transport.

The Master Cutler, Mr. P. J. C. BOVILL, who is managing director of Newton, Chambers & Company, Limited, flew to New York on Wednesday with a gift for the Mayor of New York, Mr. Robert Wagner.

A presentation was made recently to Mr. RICHARD MILES, former chairman and managing director of Head, Wrightson & Company, Limited, by the present chairman, Sir John Wrightson, on behalf of the board.

Mr. KEN JONES has joined Sheepbridge Stokes, Limited, as sales promotion executive, with special responsibilities for marketing chrome liners. He was previously with the Laystall Engineering Company, Limited.

Mr. W. M. ADAM, formerly a manager with Production-Engineering, Limited, has been appointed commercial and financial director of Brown Brothers, Limited, Edinburgh, in succession to the late Mr. ALEXANDER MATHER.

Dr. P. R. HOWARD has been appointed head of the high-voltage laboratories at the Central Electricity Research Laboratories, Leatherhead. Dr. Howard will be assisted by Mr. D. F. Oakeshott, who has been appointed deputy head.

Mr. W. J. ODDIE, son of Mr. W. M. Oddie, managing director of Spencer & Halstead, Limited, makers of shotblast and ventilation plant, etc., of Ossett (Yorks), will represent the firm at the American Textile Machinery Exhibition at Atlantic City.

Mr. A. J. BEANLAND, formerly director and general manager of the Trafford Park works of Lancashire Dynamo & Crypto, Limited, has been appointed general manager of the Radcliffe works of Mather & Platt, Limited, and a special director of the company as from July 1.

Mr. ALBERT MORTON has been invited to become the next mayor of Tipton. Mr. Morton is a moulder by trade and secretary of the local branch of the Amalgamated Union of Foundry Workers. His special interests in the Council are the local educational and recreational facilities.

Sir CHARLES CONNELL has been elected chairman of the Iron Trade Employers Insurance Association and its subsidiary, Iron Trades Mutual Insurance Company, in succession to Mr. F. C. PYMAN, who has resigned. Sir GREVILLE S. MAGINNESS remains vice-chairman of both companies.

Mr. F. S. LLOYD has been appointed purchasing officer of BTR Industries, Limited, thermoplastics and rubber manufacturers, of London, S.W.1. He has been purchasing officer of the Crompton Parkinson, Limited, group for the past five years.

Mr. JOHN W. WHITEHOUSE has been appointed chairman of Metal Products Company (Willenhall), Limited, following the death in January of Mr. G. T. WHITEHOUSE. Mr. JOHN J. T. WHITEHOUSE, Mr. ALFRED C. WHITEHOUSE and Mr. JAMES T. WHITEHOUSE have been appointed directors of the company.

The new principal of Lincoln Technical College will be Mr. GEOFFREY ALBERT CHURCH, at present head of the engineering department at Staffordshire Technical College. He will succeed Dr. E. R. WALTER, who is retiring at the end of the year. For seven years Mr. Church was senior lecturer at the South-East London Technical College.

Mr. W. D. PUGH, managing director of the English Steel Corporation, Limited, is on a business trip to Canada and the United States. Whilst in the US he will have a preview of the British Exhibition, in New York, where a display by the Corporation includes a crankshaft for the Rolls-Royce "Silver Cloud" at different stages of manufacture. Mr. Pugh is due back in this country on June 13.

Mr. A. M. PORKESS, A.M.I.MECH.E., has been appointed chief engineer of the National Gas & Oil Engine Company, Limited, Ashton-Under-Lyne. His appointment with the company, which is a member of the Hawker Siddeley group, became effective on April 19. Previously chief design and development engineer on medium-speed engines for Ruston & Hornsby, Limited, Mr. Porkess, who is 38, served his apprenticeship with G. & J. Weir, Limited, Glasgow.

Mr. H. CROWTHER, formerly managing director, has been appointed chairman of Baker Perkins (Exports), Limited. He is succeeded as managing director by Mr. H. S. HARGREAVES, who was previously deputy managing director. Mr. A. I. BAKER, chairman of Baker Perkins, Limited, the parent company, and former chairman of the export company, will continue as director. Mr. Crowther is also vice-chairman of the board of management of Baker Perkins.

Mr. P. MIDDLEMAS, a director of the Birmingham Railway Carriage & Wagon, Company, Limited, was elected president of the Birmingham Chamber of Commerce on May 23. Mr. J. J. GRACIE, a director of the General Electric Company, became senior vice-president, and Mr. W. E. KENRICK, managing director of Archibald Kenrick & Sons, Limited, West Bromwich, was elected junior vice-president. Mr. Middlemas succeeds Mr. L. G. FARMER. Speaking at the annual general meeting, Mr. Farmer said that the Birmingham Chamber, which moves in July to its new £500,000 headquarters in Edgbaston, and which has a membership of over 4,000, is to conduct "a fairly fundamental reorganization." Among other objectives it is to concentrate even more on promoting export trade: specialist advisory committees are to have increased scope, and more experts are to be called upon. A series of sections covering overseas markets is to be established, and it is hoped to facilitate more effective representations to governments at home and abroad.

LSR 81 Grinder at work on a heavy casting

COMPRESSED AIR for the FOUNDRY

Atlas Copco puts compressed air to work for industries of every class—light, medium and heavy. For foundry work there are Atlas Copco rammers, chipping hammers and grinders carefully balanced to reduce operator fatigue and ensure the best possible results. For example, rammers are designed to "walk" with a minimum of guidance, allowing the operators to give all their attention to tamping.

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With companies or agents in ninety countries, Atlas Copco is the largest organisation in the world specialising solely in compressed air equipment. Products include stationary compressors from (2.5 to 20,000 c.f.m.) ·08 to 566m³/m portable compressors, air tools, rock drills, loaders and paint-spraying equipment. Wherever you are, the international Atlas Copco group offers expert advice and provides a complete after-sales service.

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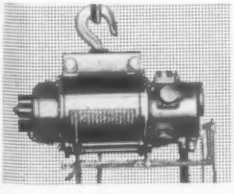
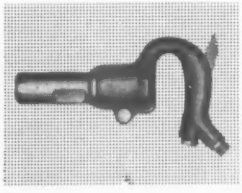
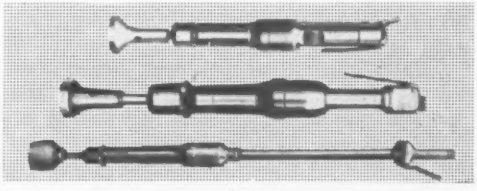


R3B Chipping Hammer



3 Rammers from the Atlas Copco range STR3



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Advertisements (accompanied by a remittance) and replies to Box Numbers should be addressed to the Advertisement Manager, Foundry Trade Journal, John Adam House 17/19, John Adam Street, Adelphi, London, W.C.2. If received by first post Monday advertisements can normally be accommodated in the following Thursday's issue.

SITUATIONS WANTED

ENGINEER, 40. Good background and experience in modern Mechanised Foundries, seeks position as Works or Chief Engineer. M.I.E.C., A.M.I.B.F., etc. Accustomed to full control. Malleable, steel. Box EF635, FOUNDRY TRADE JOURNAL.

ENTERPRISING WORKS MANAGER with 25 years' experience, seeks position in progressive foundry. Fully conversant with departmental organisation, labour control, production costing and estimating in jobbing and repetition work in iron and non-ferrous metals. Box EW658, FOUNDRY TRADE JOURNAL.

FOUNDRYMAN (40), M.I.B.F., nine years' managerial experience all aspects ferrous and non-ferrous production, mechanised, jobbing. At present employed Ceylon. Free August, 1960. Seeks position with reputable company. Anything considered. Could represent foundry plant, or allied concern such as refractories, etc. S.E. Asia or elsewhere. All replies to be addressed to Box FO618, FOUNDRY TRADE JOURNAL.

TECHNICAL REPRESENTATIVE wishes to represent a Foundry for Cast-iron and Non-ferrous Castings, on expenses and commission. First class connections in London and Home Counties. — Box TR666, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT

PATTERN INSPECTOR. First class Pattern Checker required, must be familiar with first class Wood and Metal Patterns coupled with knowledge of Modern Foundry Technique. Full details to: THE UNIVERSAL PATTERN & PRECISION ENGINEERING CO. LTD., Kelvin Way, Crawley, Sussex.

WANTED, Skilled ALUMINIUM or BRONZE MOULDER. Permanent position for man with ability. Wide range of bench and floor work. Modern foundry, situated in Leicestershire. Good rates of pay or piece work. Housing assistance arranged for suitable applicant. Box WS665, FOUNDRY TRADE JOURNAL.

ALUMINIUM MOULDER for Sand castings. New foundry, good conditions and top wages. Apply ROOD END FOUNDRY LTD., Oldbury.

METALLURGICAL CHEMIST urgently required to take charge of Laboratory of West Midland Grey Ironfoundry. Please write giving full details of experience, age and salary required to Box MC667, FOUNDRY TRADE JOURNAL.

DESIGN ENGINEERS AND DRAUGHTSMEN familiar with Foundry Plant and Equipment required. These are permanent staff posts with excellent prospects. Five-day week. Pension Scheme. Canteen. Apply: EFCO LIMITED, 161, Queens Road, Weybridge, Surrey.

METALLURGICAL CHEMIST required to take charge of laboratory employing people on Chemical and Metallurgical Analysis in connection with a large Iron Foundry situated in a pleasant area of the South Coast. Housing available. Please reply in writing, stating age, experience and salary required. Box ME629, FOUNDRY TRADE JOURNAL.

SITUATIONS VACANT—*contd.*

THE

FOUNDRY TRADE JOURNAL

has a vacancy for a

SENIOR EDITORIAL ASSISTANT

(in London)

THIS is a permanent and progressive appointment. The successful applicant will be about 35 years of age and will be at present holding a position of active responsibility in the foundry industry. Some experience of technical writing will be an obvious advantage. The initial salary may not exceed £1000 p.a., but future remuneration will match achievement and there is ample opportunity for the right man.

Write, with fullest details of training, experience, and present position to the

Managing Director,
Foundry Trade Journal,
17/19 John Adam Street,
London, W.C.2

SITUATIONS VACANT—*contd.*

SENIOR VACANCY exists in Methods Department of Steel Foundry in North West of England. Applicants should have good knowledge of modern methods and calculating weights from blue prints. Write stating experience, and salary required to Box SV647, FOUNDRY TRADE JOURNAL.

MANAGER required for Ironfoundry with up to 50 tons weekly capacity. Previous experience in management essential and must give evidence of capacity to produce sound castings and ability to control costs. A good salary will be offered to the right man. Send full particulars of experience, etc., to Box MR651, FOUNDRY TRADE JOURNAL.

CROFTS (ENGINEERS), LIMITED Empire Works, Thornbury, Bradford, 3, Yorkshire, have vacancy for ASSISTANT STEEL FOUNDRY MANAGER (age 30 to 40 preferred) for Foundry with a weekly capacity of 100 tons machine moulded and jobbing castings (Basic Electric) maximum weight 10 tons. Successful applicant must be capable of assuming full control of Steel Foundry in due course and must, therefore, have the necessary technical qualifications and management experience in steel founding. Write stating age, experience and present position to COMPANY SECRETARY.

Arising from their expansion and re-organisation plan CATTON & CO. LTD., (Steelfounders) of LEEDS have vacancies to offer as follows:

METALLURGIST—for steel foundry technical control duties, together with development work in both the sand and metallurgical fields. Applicants should have experience in ferrous metallurgy and foundry experience would be an added advantage.

METHODS ENGINEER—for investigational and development work in the field of gating and feeding of steel castings. Steel foundry experience desirable but an enquiring mind, together with initiative and determination to logically pursue shop floor problems, is of great importance.

MOULDING SHOP FOREMAN—for the control of a jobbing moulding shop producing steel castings up to five tons finished weight. Moulding experience, together with the ability to organise and control a team of skilled moulders and closers, is essential.

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All the appointments carry attractive salaries and non-contributory pension benefits and assistance with housing would be provided, if necessary.

Replies—which will be treated in the strictest confidence—to the TECHNICAL DIRECTOR, CATTON & CO. LTD., CHADWICK STREET, LEEDS, 10.

SITUATIONS VACANT—*contd.*

FOUNDRY MANAGER

for a well-known and long-established jobbing foundry near Manchester, employing about 50 people and supplying regular customers in the North-West. Starting salary will depend on experience and qualifications. There is also a pension scheme.

The Foundry Manager will be directly responsible to the Director and General Manager for the foundry and the pattern shop and for all aspects of their management including labour control, production planning, estimating, rate-fixing, and the maintenance of quality and output.

Applicants should be between 40-45 and have had wide practical experience of a jobbing foundry of similar size and be fully conversant with CO_2 core-making and moulding.

Preference will be given to a practical man who has sound supervisory experience and who wishes to work in a small unit with a high reputation in its field.

Please write briefly in first instance, quoting Reference No. 717, to:—

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RETAINED TO ADVISE ON THIS APPOINTMENT
The strictest confidence will be observed and no details of candidates will be passed to clients without candidates' permission.

ASSISTANT PLANT METALLURGIST

WITH Iron and Steel Melting Furnace experience, for control of Hot Blast Cupolas and Electric Arc Furnace. Shift-work involved.

Qualifications—at least O.N.C. Salaried staff appointment, contributory Superannuation Scheme.

Details of qualifications, training, experience, etc., in writing to:

Personnel Manager,
LEY'S MALLEABLE CASTINGS CO., LTD.
Derby.

EXPERIENCED ESTIMATOR required for a West Midland Ironfoundry. Applicants should have had experience in weight estimation and estimation of production costs. Please write, giving full details of experience, age and salary required, to Box EX 654, FOUNDRY TRADE JOURNAL.

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MANAGER FOR FOUNDRY.

EXPANSION and technical development has led to the creation of a new managerial role in our large, mechanised non-ferrous Foundry in London. The Manager will be completely responsible for production and development work on plant for continuous casting, centrifugal casting and chill casting in non-ferrous metals. About 12 subordinates to begin with and assistance from Foundry and Factory level engineers, metallurgists and services.

Requirements: Degree in metallurgy or engineering or A.I.M. or equivalent. Foundry experience or training in foundry practice preferred; age range 25 to 35; most important is the personality and drive needed for production management. Salary bracket £950 to £1,350, starting in bottom half.

Apply PERSONNEL MANAGER (Ref.2917), THE GLACIER METAL CO. LTD., Ealing Road, Alperton, Wembley, Middx.

AGENTS

MANUFACTURERS AGENT. Well-connected in the Midlands foundries requires further Agency, on commission basis. Box MA634, FOUNDRY TRADE JOURNAL.

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WANTED

MOULDING M/cs: HPL1 and 2. Titan 75-lb. Core Blower. Redford Bench Type ditto. Fordath Core Sand Mixer, 5-10 cwt. Sand Mills, 3 ft. 6 in. to 5 ft. dia. Box WM655, FOUNDRY TRADE JOURNAL.

MOULDING BOXES required—tops, bottoms and middles—sizes from 4 ft. × 4 ft. up to 8 ft. × 7 ft. Also top parts, 15 ft. × 10 ft. and 12 ft. × 12 ft. Cast Iron or Steel, good condition. Reply to: DUDLEY FOUNDRY CO., LTD., Moor Lane, Brierley Hill.

WANTED. Pattern Miller, 24 in.—30 in. Bandsaw, 18 in.—26 in. Sawbench, Dimension Sawbench, Spindle Moulder & Disc Sander about 30 in. Preferably Wadkin's. "LONG MEADOW," Manor Lane, Whatton, Notts.

WANTED. Ladle for steel. Capacity 12/20 tons. With or without mechanical tipping gear. Bottom pouring gear an advantage. Box WL638, FOUNDRY TRADE JOURNAL.

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GEORGE ELLISON draw-out type L.T. Switchboard. Incoming 1,000 amperes. Four outgoing 300 amperes. All one unit with four wire busbar chamber and instrumentation. Condition second hand, unused. WHITEFIELD MACHINERY & PLANT LIMITED, 48, Chatham Street, Edgeley Hill, Stockport, Cheshire. Telephone No. Stockport 4471.

OFFERS invited for Foundry Equipment Ltd. Senior No. 1 Sand Rammer, with automatic feed. Available for viewing Monday to Friday. Apply G. POTTER & SONS LIMITED, 40, Western Road, Leicester.

MACHINERY FOR SALE—*contd.*

TWW

AIRLESS Rotary Barrel Shot Blast Machine ("Sand Wizard" by Constructional Engineering Co.) size 44 in. × 40 in. complete with Elevators, Dust Extraction Plant, etc., arranged 400/440/3/50 cycles.
B.M.M. Jolt Squeeze Moulding Machine. HPL1.
Two B.M.M. Jolt Squeeze Turnover Moulding Machines, type RDO.
JACKMAN Shot Blast Cabinet, 32 in × 24 in. × 33 in., with dust extractor, etc.
BRAYSHAW Gas Fired Muffle Furnace, 40 in. × 30 in. × 18 in., with blower, unbricked.
SIROCCO 30 in. dia. Cupola Blower.
WIDE RANGE OF AIR COMPRESSORS ALWAYS IN STOCK

THOS. W. WARD LTD.
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ELECTRICALLY DRIVEN COMPRESSOR SETS FOR USE ON 400/440 VOLTS, 3 PHASE, 50 CYCLES.

376 C.F.M. BELLISS & MORCOM 125 p.s.i.
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THE FOLLOWING PRACTICALLY NEW EQUIPMENT FOR SALE AT BARGAIN PRICES.

Pneulec 2-ton capacity Balanced Blast Cupola.
Three small Cupolettes.
Pneulec motorised Sand Disintegrator.
Spermolin 2-cwt. capacity Motorised Sand Mixing Machine.
Fordath, Rotoil No. 4 motorised Sand Mixing Machine.
MacNab jolt squeeze Moulding Machine.
New and unused drawer-type Core Ovens, by Alldays & Onions, oil fired.
New Bale-out and Lift-out Furnaces. Leaflet and photograph available.
New Polford 600 lb. capacity Coke Fired Furnace.
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Large stock of Ladles up to 10-tons capacity. Please send for list.
Fordath motorised Rotary Core Making Machine.
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Large size Adaptable hand Moulding Machine.
Full details on request from:

ELECTROGENERATORS LTD.
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LADLES
STOCK UP TO 5TON CAP.
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SAGAR Electric 30 in. Disc & Bobbin Sander, new machine at substantially reduced price. DALTONS, Canal Street, Nottingham.

CONSTRUCTIONAL SAND WIZARD S/B. Barrel 44 × 40, with Dust Collector.
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Also all types of Foundry Plant and Equipment, send your enquiries:

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ACME Gas-Heated Two Loop Continuous Vertical Core Drying Stove, about 16 ft. × 9 ft. × 6 ft. × 27 ft. 7 in. high, with Electrically Operated Automatic Loading and Unloading Device, working in conjunction with Parker-Mitchell Electrically-driven Continuous Pendulum Chain Conveyor, about 240 ft. long, having 43 trays, 7 ft. 6 in. × 2 in.; also Parker Mitchell Overhead Travelling Electric Hoist Block and Runway, with 3½ cwt. Bottom Discharge Bucket. The electrical equipment is for A.C. three-phase 50-period 440 volt supply, with Dewhurst and Igranic Contactor Control Panels. For further particulars and appointment to view please reply to:

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UNUSED "MARTONAIR" Horizontal Pneumatic Cable Hoists. 300 lbs. capacity, 100 lbs. working pressure. Four-wheel articulated suspension trolley. Pendant control. £15 each. Box UM663, FOUNDRY TRADE JOURNAL.

WADKIN & SAGAR 6 in. Centre motorised Gap Bed Woodturning Lathes, travelling slide tool carriage, outside turning. DALTONS, Canal Street, Nottingham.

ONE 6 cwt. capacity CORE SAND MIXER, complete with electrics suitable for 400/440 volts, 3 phase, 50 cycle supply. Box CA664, FOUNDRY TRADE JOURNAL.

JOLT SQUEEZE Moulding Machines in good condition. Suitable for use with (*a*) 24 × 20 × 6 box and (*b*) 17 × 14 × 4 box. Reply to Box JS668, FOUNDRY TRADE JOURNAL.

MONOMETER 1,500-lb. brass capacity central axis tilting furnace, tube-pouring, complete with fan, new Morgan plumbago crucible and accessories. Furnace practically new. Please reply to Box MO669, FOUNDRY TRADE JOURNAL.

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Fitted with dry spark arresters—flow meter—pressure guage and starter motor.
TWO HILLTOP HAND PRESS MOULDING MACHINES
Type: H.T.F.5.
Max. mould box size: 16 in. × 18 in.
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Newstad Patent Gas fired hot air unit size 2.
Capacity: 30,000 cu. ft. per hour at 400 deg. C.
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These Locomotives are in good condition and may be inspected by appointment.
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All sizes. Rooms or Cabinets. Ex stock or prompt delivery. Low prices.
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CHAPLETS are the SMALL
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CASTINGS.—We can save your porous castings, ferrous or non-ferrous, by an approved impregnation Process; sample castings treated. A.I.D. approved.—RECUPERO, LTD., 66, South Harrow Viaduct, Harrow, Middlesex 'Phone: Byron 1178.

We have capacity available for
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Long & Short runs, Prompt delivery.
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BALE-OUT & LIFT-OUT FURNACES *oil and gas fired*
100 lbs. to 350 lbs. brass capacity new LIFT-OUT furnace from £92
100 lbs. to 400 lbs. aluminium capacity new BALE-OUT furnace from £112
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FOR successful castings from your plant, Pressurecast matchplates, precision wood or metal pattern equipment can be purchased quickly, competitively, from BOOTH BROS. ENGINEERING, Baggrave Street, Leicester. Tel. 67020

PATTERNS for all branches of Engineering for Hand and Machine Moulding.—FURNESTON & LAWLOR, LTD Letchworth.

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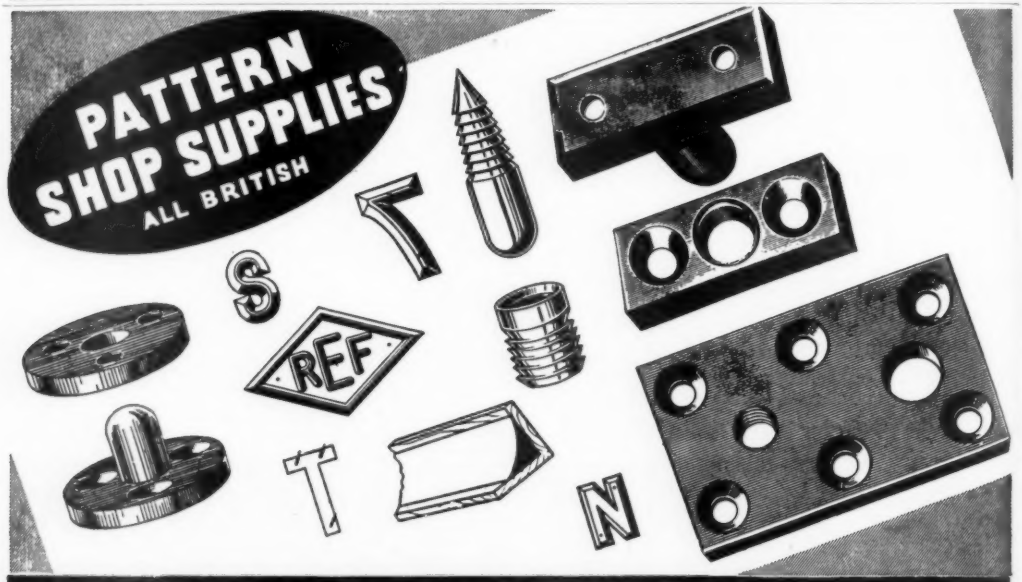

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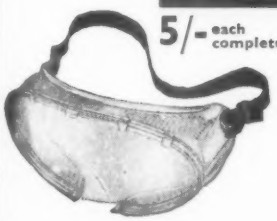

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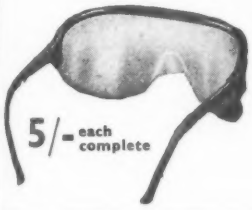

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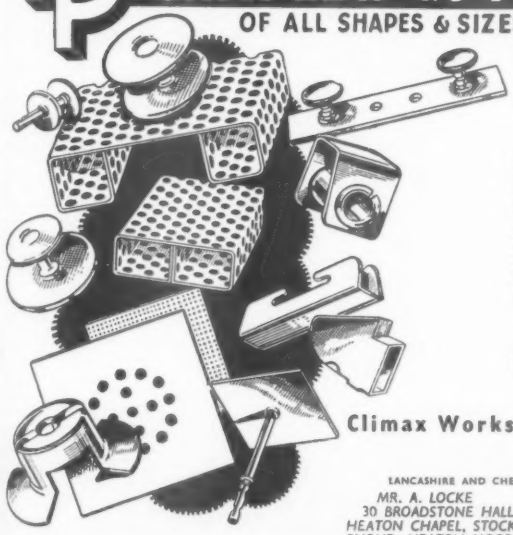

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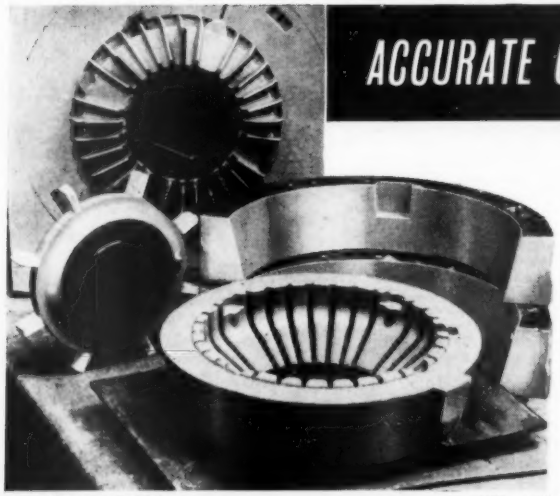

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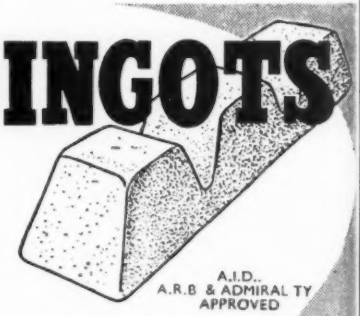

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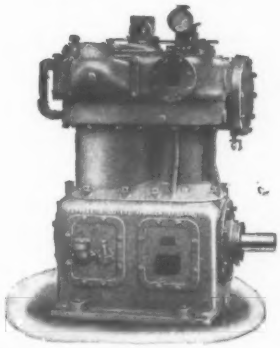

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